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ACUTE LARYNGOTRACHEOBRONCHITIS

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A number of papers have appeared on laryngotracheobronchitis in recent years, almost wholly from otolaryngologic sources. Notable contributions have been made by Chevalier Jackson,[1] Lyman Richards[2] and Sidney Farber, T. R. Gittens,[3] H. L. Baum,[4] D. M. Tolle,[5] A. H. Neffson and S. M. Wishik[6] and others. It has seemed to us worth while to approach and to present this live subject with more regard to a pediatric point of view than has been usual hitherto and to combine the clinical, endoscopic and pathologic aspects of the disease as encountered in a large children's hospital over a number of years.

The present report is an attempt at an analysis of our experience with this disease at the Children's Memorial Hospital over a period of ten

From the Children's Memorial Hospital and the Otho S. A. Sprague Memorial Institute.

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1. Jackson, Chevalier, and Jackson, Chevalier L.: (*a*) Acute Laryngotracheobronchitis, J. A. M. A. **107**:929-932 (Sept. 19) 1936; (*b*) Acute Laryngotracheobronchitis: Bronchoscopy, Esophagoscopy and Gastroscopy, Philadelphia, W. B. Saunders Company, 1934, p. 311.

2. Richards, Lyman: Fulminating Laryngo-tracheo-bronchitis, Ann. Otol., Rhin. & Laryng. **42**:1014-1040 (Dec.) 1933. Pathologic report by Sidney Farber.

3. Gittens, T. R.: Laryngitis and Tracheobronchitis in Children: Special Reference to Non-Diphtheritic Infections, Ann. Otol., Rhin. & Laryng. **41**:422-438 (June) 1932.

4. Baum, H. L.: (*a*) Some Endoscopic Observations on Laryngotracheobronchitis, Ann. Otol., Rhin. & Laryng. **33**:782-788 (Sept.) 1924; (*b*) Acute Laryngotracheobronchitis, J. A. M. A. **91**:1047-1102 (Oct. 13) 1928.

5. Tolle, D. M.: Croup: Analysis of Three Hundred and Forty-Four Cases, Am. J. Dis. Child. **39**:954-968 (May) 1930.

6. Neffson, A. H., and Wishik, S. M.: Acute Infectious Croup: a General Study of Acute Obstructive Infections of the Larynx, Trachea and Bronchi, with an Analysis of 727 Cases: II. Acute Non-Specific Infectious Group, J. Pediat. **5**:617-641 (Nov.) 1934.

years, from 1927 to 1936, inclusive. As the mortality has varied all the way from 25 per cent to nearly 100 per cent, according to the reports from different medical centers, it would seem rather evident that there is no fixed interpretation of what constitutes laryngotracheobronchitis and that a sharper definition of this clinical entity, if such it is, must be established if reports from various centers are to be compared, especially as to end results, which, after all, have the outstanding claim on one's interest. To the pediatrician of wide experience, who encounters a variety of infections of the respiratory tract dominated by laryngeal and obstructive symptoms, most of which never come within the purview of the laryngologist or of the bronchoscopist, it is evident that a sharp differentiation according to the precise nature of the involvement in a given case is not always a simple matter, especially, as one must find its

TABLE 1.—*Mortality Among Forty-Five Patients with Fulminating Laryngotracheobronchitis from the Children's Memorial Hospital**

	Year										10 Yr. Period	
	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936		
Total number of cases with operation	4	1	2	0	5	2	8	4	3	12	41	
Mortality	1	0	2	0	4	1	3	1	0	3	15	36%
Intubation only	2	0	2	0	1	1	4	1	2	0	13	
Mortality	1	0	2	0	1	0	1	0	0	0	5	38.5%
Tracheotomy	2	0	0	0	4	1	4	2	1	10	24	
Mortality	0	0	0	0	3	1	2	1	0	3	10	41.7%
Intubation, then tracheotomy	2	0	0	0	1	0	0	1	1	2	7	
Mortality	0	0	0	0	1	0	0	1	0	0	2	28.5%
Tracheobronchial aspiration only	0	1	0	0	0	0	0	1	0	2	4	
Mortality	0	0	0	0	0	0	0	0	0	0	0	0%
No operation	1	0	0	0	3	0	0	0	0	0	4	
Mortality	1	0	0	0	3	0	0	0	0	0	4	100%
Total number of cases of fulminating involvement	5	1	2	0	8	2	8	4	3	12	45	
Total mortality	2	0	2	0	7	1	3	1	0	3	19	42.2%
Total percentage of mortality	40%	0%	100%	0%	88%	50%	37.5%	25%	0%	25%	42.2%	

* The total mortality for the nine year period from 1927 to 1935, inclusive, was 48.4 per cent. The total mortality for the year 1936 was 25 per cent.

exact place in a series of manifestations that range in severity all the way from simple catarrhal laryngitis to rapidly fatal fulminating laryngotracheobronchitis.

For all of these reasons, comparative statistics from different centers must be looked on as approximations rather than as wholly dependable evaluations. There is still another determinant that plays an important role in all the series of cases that occur within a short period of time. There are good years in the history of laryngotracheobronchitis and bad years, as in the history of so many other diseases. In our own series, as shown in table 1, the mortality varied from 0 in two years to 88 per cent and 100 per cent, respectively, in another two years. As will become evident later, however, the genius epidemicus was not the main factor

in our series. That it did play an important part in certain reported series of cases with appalling mortality and in other series with surprisingly low mortality seems probable. That the method of treatment is of equal, or far greater, importance is equally probable. Our material lends itself with peculiar effectiveness to answering these questions. A period of ten years is enough to smooth out the inequalities that are due to the genius epidemicus; the treatment we used in the years 1927 to 1935, inclusive, differed radically from that of 1936, when for the first time we felt that we were adequately equipped to fight this treacherous disease—and it is no less than fight. We are thus able to compare our own results obtained with different methods of treatment, all of the cases being under the observation of at least one of us. Of added interest is the fact that during the year 1936, when we were equipped to handle these patients as we had not been before, there was an unusually large number of cases of more severe involvement, two conditions that often go together, as was shown also in the year 1931 (table 1). Even so, the very nature of the material makes it possible to deal only in approximations, try as we may honestly to reach an accurate interpretation and to make a fair comparison.

Our first object, then, for comparative purposes is to establish a criterion for our diagnosis of laryngotracheobronchitis, regardless of whether the disease is considered as a separate clinical entity or merely as an extension of an infection of the respiratory tract that differs only in degree from a milder or a less extensive invasion of the respiratory tract; regardless, again, of whether there is a difference, in the kind or in the degree of virulence of the organism or in the resistance of the host. During the ten year period under consideration, 129 children were admitted to the Children's Memorial Hospital with the presenting symptom complex of a croupy cough, hoarseness, a variable degree of fever, prostration and marked obstruction of the respiratory tract, as shown by restlessness, air hunger and inspiratory retraction of the suprasternal notch and of the lower end of the sternum. This group does not include children with laryngeal diphtheria or illness due to foreign bodies or to trauma. Of these 129 patients, 84 were treated by palliative measures alone, and of this group only 1 died, of a general infection of which laryngitis was only a minor part. The condition of the remaining 45 patients was of such a nature and of such severity that we were convinced that recovery was impossible, or highly improbable, without instrumental relief. Four patients died in the earlier years of our investigation without such intervention because our experience up to that time had left us uncertain as to whether either intubation or tracheotomy did not furnish a greater hazard than mere palliative treatment. For our present purpose their cases are included among the 45 cases we feel justified in considering true cases of laryngotracheobronchitis. We are keenly aware of a hazard inherent in both intubation and trache-

otomy and therefore hesitate as long as seems consistent with safety to resort to such procedures. Thus, a 10 week old infant with profound obstruction of the respiratory tract was anxiously watched for more than a week, while we debated whether we should proceed to more radical measures or not, until recovery was finally assured without instrumental intervention of any kind. While this child, and possibly many others, might well be included in our series, we have included only those on whom bronchoscopy, intubation or tracheotomy was done, or who died with what seemed to us a like condition without having received such treatment. For the present, the criterion that we have accepted seems the only one that is feasible, in view of the conflicting reports that have come from different centers. Even so, there is still a weak point in a comparative analysis of mortality, both in our own series and in that of others, in that some clinicians will inevitably resort to radical measures on less serious indications than others. For all of these reasons the 12 patients that were observed in our series in 1936, all by the same clinicians and under what we feel were ideal conditions for diagnosis and treatment, will naturally be of the greatest interest and value from that point of view.

With a disease that carries a generally reported mortality of 50 per cent or more, it is evident why a major interest lies in the matter of treatment and its bearing on mortality. Laryngotracheobronchitis is a complicated disease. It is one in which a rational and effective therapy can be established only when based on an adequate knowledge of both symptomatology and underlying physical conditions. The mechanism that brings about the symptoms and signs is brought to light through the laryngoscope and the bronchoscope, and the bronchoscopic findings, in turn, are made clear on the necropsy table. A brief discussion of each of these aspects is, therefore, of basic importance.

SYMPTOMATOLOGY

The symptomatology is strikingly uniform, as a whole, but has wide individual variations as the disease progresses. The reason for this will become evident with consideration of the bronchoscopic and pathologic changes that are peculiar to the disease. There is a predilection for the first two years of life. In our series of 45 cases, in 10 the condition occurred in the first year, in 20 in the second year and in only 15 after the second year. The ominous significance of this early age is evident when one considers the nature of the respiratory obstruction, on the one hand, and the small caliber of the airways and the yielding nature of the chest of the infant and of the young child, on the other hand. In about one half of our patients the onset was said to have followed an infection of the upper respiratory tract that did not seem to differ from ordinary infections of that kind, or from other infections then prevalent in the household until croupy and obstructive symptoms

arose. In the others the onset was said to have been sudden. Information of this kind is notably not dependable and is of relatively little importance. By the time the child comes under medical observation the picture is that of a severe infection of the respiratory tract, with laryngeal and obstructive symptoms as outstanding features. The respirations are rapid and labored. There are an inspiratory stridor, commonly an expiratory wheeze, marked hoarseness, as shown both in the speech and in the cry, rarely aphonia, and a deep inspiratory retraction of the suprasternal notch, of the supraclavicular spaces, of the substernal region and, in infants, even of the sides of the thorax. The cough is croupy but rarely as unyielding and metallic as in laryngeal diphtheria. Early in the disease this may be a distressing symptom; later, as pointed out by Chevalier Jackson,[1] the cough reflex is benumbed or absent and coughing is abolished to a corresponding degree. There is great restlessness, due to air hunger and to the struggle to get air into the chest and out of it. The temperature usually ranges from 102 to 104 F., or even higher, and the child looks toxic and tired. There is usually some cyanosis, which is especially evident in the nails and lips, but this is rarely as deep as in membranous croup. In cases of severe, protracted involvement the color is of an ominously ashen gray hue. If the condition progresses and is unrelieved, the child finally sinks into a relaxed agonal state, is utterly exhausted and, as if resigned to the inevitable, gives up the struggle. It is then profoundly toxic, with a high, rapidly rising fever and the ashen color of a terminally failing circulation as the end approaches.

On physical examination the throat is found to be inflamed. This condition may be of mild or of severe degree but is in no way distinctive. Auscultation reveals a fairly sharp inspiratory stridor and nearly always an expiratory wheeze. The former is probably mainly laryngeal in origin, while the latter is due to partial obstruction of the trachea and of the bronchi. There is not, as a rule, the sharp to and fro stridor of laryngeal diphtheria. It is evident, however, that there is trouble both in getting the air in and in getting it out. Coarse rales are commonly heard all over the chest, coming both from the throat and from the bronchi. The air may enter every part of the lungs, and there may be no appreciable impairment of resonance. At any time the picture may change with startling rapidity. There may be localized areas of dulness to percussion, together with suppression or absence of breath sounds, or bronchial breathing and bronchophony, as atelectasis occurs owing to the complete plugging of a bronchus with the characteristically thick, tenacious gummy exudate. If a main bronchus is occluded, there will be greater restlessness, cyanosis and air hunger. To the dulness and to the suppression or absence of breath sounds will then be added a notable shift of the heart toward the affected side and an increase of breath sounds and possibly of resonance on the opposite side. This

shift is more easily recognizable if the occlusion of the main bronchus is on the right side. The cardiac tones are then heard with greater intensity to the right of the sternum than to the left, a more dependable sign than that elicited through percussion or by scratching. More rarely, the heart may be pushed away from the affected side if there is obstructive emphysema due to partial blocking of a main bronchus. The wheeze may then be accentuated, especially on the side that is involved. The pathogenesis of these signs is confirmed by the fact that all of them may be relieved by aspiration of the obstructing exudate, which is followed by prompt return of the heart to its normal position and by relief of the more alarming dyspnea.

In patients that do not recover, death occurs from a variety of conditions. In prolonged cases it may be due to exhaustion, with cardiac and respiratory failure. It may occur at any time, on short notice, because of extensive atelectasis. Obstructive emphysema and compensatory emphysema that has passed beyond a usefully functional stage probably play a minor part. As will be pointed out later, there is at times a terminal state in which there is no longer a copious free exudate within the bronchi that can be removed by aspiration. In its stead there is an occluding thick gray exudate that clings to the tracheal and bronchial walls and cannot be aspirated. Bronchopneumonia probably enters the picture in all cases of severe involvement as the pathologic process reaches the terminal bronchioles and the alveoli. It is obviously impossible at times to differentiate clinically between bronchopneumonia and patchy areas of atelectasis and emphysema. Roentgen examination might supply the answer, but a solution would call for no change in treatment, and rest is of far greater importance than an accurate differentiation. Finally, there are doubtless many cases in which there is a septicemia that may be the determining factor in the end result. Again rest is more important, to the infant especially, than a series of blood cultures.

THE BRONCHOSCOPIC PICTURE

The bronchoscopic picture of the disease is characterized by changes throughout the entire lower respiratory tract. These changes consist in intense inflammation of the mucosal lining, with thickening of the membrane and resulting obstruction of the airway in the larynx and in the smaller bronchi. Associated with this is the formation of large quantities of thick, tenacious secretions, equally distributed throughout the tracheobronchial tree. These secretions add to the obstructive symptoms, frequently becoming dry, coagulated and crustlike and adhering to the mucosa. They obstruct the laryngeal airway or even the lumens of the bronchi.

When one depresses the tongue with the laryngoscope, the pharynx frequently shows little change except for a moderate degree of inflammation and the presence of a considerable amount of mucopurulent

secretion. Occasionally, however, there is a marked supraglottic obstruction caused by an edematous thickening of the epiglottis, of the aryepiglottic folds and of the false cords. It is this boggy inflammatory edema that would make intubation futile should operative intervention become necessary, because the obstruction would be above the tube.

Generally the milder changes occurring in these structures give no clue to the intense inflammatory process below the cords. Even the cords themselves frequently remain unchanged except for slight redness and thickening and loss of their sharp phonating edges. One striking feature, however, is the almost complete lack of motion of the larynx on respiration and on phonation. The soft subglottic tissues bulge from the phonating edges of the cords to meet in the midline, forcing the cords well apart and thus preventing any motion on phonation.

The mucosa immediately below the cords is changed markedly in color to deep red and has a velvety appearance. Only a small posterior chink allows air to pass. If the anterior portions are not obstructed by the bulging subglottic tissue itself, obstruction is completed by dry yellow crusts or by the tenacious mucopurulent secretion just described. It is this area immediately below the vocal cords which at an early period produces the principal obstruction to the airway.

A small bronchoscope can be insinuated through the posterior chink after suction has been used to aspirate the obstructing exudate lying on the larynx. The bronchoscope is immediately filled with secretion which has accumulated in the trachea. After this has been aspirated with a strong suction pump, the tracheal mucosa is found to be smooth, red and velvety. The lumens of all the bronchi are markedly diminished in size, and the sharp appearance of the bronchial divisions is lost. At this stage the secretion can still be aspirated easily, and the airways can be adequately kept open if one removes the mucopurulent material either through the bronchoscope or, if a tracheotomy has been done, with a catheter.

Occasionally in patients who have been tracheotomized aspiration through a catheter is not sufficient to relieve the obstruction, owing to the formation of thick, gummy, ropy exudate and of crusts. It may then be necessary to insert a bronchoscope, either through the mouth or through the tracheotomy opening, in order to expose the obstructed bronchus and to remove the crusts with a forceps.

There is an almost terminal stage, however, when the temperature rises steadily, the dyspnea increases and the child gradually becomes more cyanotic or ashen gray. Physical findings indicate that air is entering both lungs, but the breath sounds have become distant or leathery. Both phases of respiration are markedly shortened. Aspiration is futile; the relief formerly obtained does not occur, and the child becomes even worse because of the effort of coughing. Because

these findings are also present when plaques of exudate firmly adhere to the mucosa and partially obstruct the trachea or both main bronchi, a bronchoscope is used on these patients in an effort to remove obstructing secretions with a forceps. At this stage, however, there has been a marked change in the bronchoscopic picture. Aspiration with the catheter through the tracheotomy tube has left the lumen entirely clear of secretions and free exudate, but the intensely red mucosa has been lost and is replaced throughout the tracheobronchial tree by an exudate with a dry, glazed, gray surface. It is thick enough to cause a decided narrowing of the tracheal lumen and in some instances to cause such a narrowing of the lumens of the main bronchi that even the smallest aspirator cannot be passed where previously a small bronchoscope had entered. Postmortem examination has confirmed this bronchoscopic picture, the exudate having been traced into the smallest bronchi, where it has obstructed them completely.

PATHOLOGY

A knowledge of the underlying anatomic conditions and of the peculiar nature of the pathologic changes that are characteristic of laryngotracheobronchitis is necessary to a clearer understanding of both the bronchoscopic and the symptomatic aspects and of the rationale of treatment. The epithelium of the supraglottic and subglottic regions, as well as that of the trachea, is of a ciliated pseudostratified columnar type, while that of the vocal cords is stratified squamous epithelium.[7] The columnar epithelium rests on a distinct basement membrane and overlies submucous connective tissue, which is somewhat loose in structure in the supraglottic region and extremely loose in the subglottic region[1] or zone of the conus elasticus (fig. 1). In this zone one can see grossly the bulging of the loose tissues adjacent and distal to the vocal cords, with narrowing of the airway at this point as compared with the lumen of the more distal trachea (figs. 2 and 3). The larynx and trachea are rich in secretory glands, mucoserous in character (fig. 4). The lymphatic vessels of the supraglottic and of the subglottic submucosa are numerous, and those of the latter communicate freely with the lymphatics of the tracheal submucosa. The vocal cords are essentially devoid of lymphatics, and the supraglottic and subglottic lymphatics communicate only in the narrow zone at the posterior wall of the larynx (fig. 3).[8]

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7. Maximow, A. A., and Bloom, W.: Textbook of Histology, Philadelphia, W. B. Saunders Company, 1931, pp. 437-460.

8. (*a*) Guement, M. M.: L'appareil lympho-ganglionaire du larynx, Rev. de laryng. **55**:828-861 (July-Aug.) 1934. (*b*) Lore, John M.: Practical Anatomical Considerations of the Larynx, Laryngoscope **43**:693-717 (Sept.) 1933. (*c*) Thomson, St. Clair, and Colledge, Lionel: Cancer of the Larynx, London, Kegan Paul, Trench, Trubnar & Co., Ltd., 1930.

Fig. 1.—Photomicrograph showing vocal cord, which is seen as the fibro-elastic bundle in the upper half of the photograph, and adjacent loose, subglottic tissue, in the lower half of the photograph; × 180.

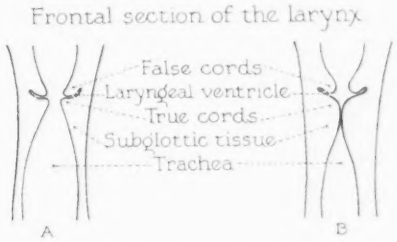

Fig. 2.—*A*, frontal section of the normal larynx. *B*, similar section, showing complete obstruction of the airway caused by subglottic edema. Lesser swelling of the supraglottic and tracheal membranes is also indicated.

The fibro-elastic vocal cords, covered by a tightly adherent stratified squamous epithelium and essentially free of lymphatics, form an anatomic barrier to lymphatic transmission between the two zones. The posterior laryngeal wall is the connecting link.

Fulminating laryngotracheobronchitis has usually been attributed to infection by the hemolytic streptococcus.[9] Other organisms, such as pneumococci [10] and influenza bacilli, have been reported, in addition to the streptococci. Staphylococci [11] and influenza [6] bacilli have occa-

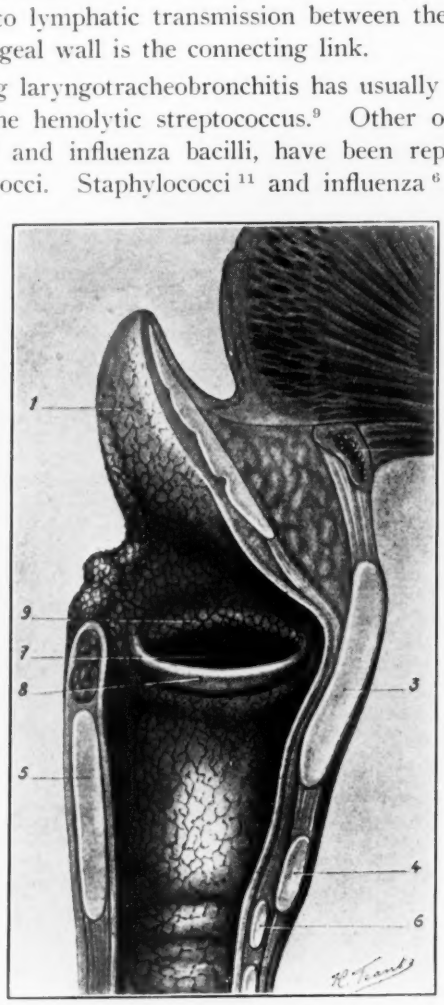

Fig. 3.—A scheme of the dye-injected lymphatics of the supraglottic, subglottic and tracheal regions. Note that the vocal cord is essentially lymphatic free and that the supraglottic and subglottic lymphatics communicate only in the narrow zone at the posterior wall of the larynx. Note the bulge of the subglottic tissue adjacent and distal to the vocal cord. Taken from M. M. Guement.[8a]

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9. Jackson and Jackson.[1] Richards.[2] Neffson and Wishik.[6]

10. Richards.[2] Neffson and Wishik.[6]

11. Neffson and Wishik.[6] Gardner, L. M.: Three Cases of Infection of the Upper Respiratory Tract with Staphylococcus Pyogenes Aureus Presenting the Symptom Complex of Acidosis, Am. J. M. Sc. **155**:388-392, 1918.

sionally been found alone. In our series, in only about one half of the patients was a streptococcus found, in spite of repeated cultures both of material taken from the throat and of the bronchoscopically aspirated material.

Farber [2] pointed out that the infection is a descending one, starting from the pharynx, and stated that the invading organism, when it is a streptococcus, descends by way of the lymphatics and the interstitial tissues. He considered organisms other than the streptococcus, namely,

Fig. 4.—Intact mucoserous glands of the proximal end of the trachea in the presence of edema and acute cellular infiltration of the submucous tissue; × 125.

the pneumococcus and the staphylococcus, as secondary invaders, the latter contributing to more marked destruction of the mucosa and wall of the trachea than occurs in the pure streptococcic infection.

When the invading organism succeeds in passing the previously described anatomic barrier by way of the lymphatics and the interstitial tissue of the posterior laryngeal wall, usually there is left behind only a mild to moderate degree of supraglottic swelling and inflammation.

From the subglottic area the organisms may invade by way of the tracheobronchial lymphatics and interstitial tissue and may cause an interstitial or lobular pneumonia.

The first signs of obstruction are usually due to the marked inflammatory swelling and edema of the loose subglottic tissue.[1] If infection spreads, the same series of changes occurs in the trachea and bronchi, except that with a less loose submucous tissue there is less swelling. The irritation of the infection is presumably the cause of the increased secretion of the tracheobronchial glands, the secretion being at first serous [1] and later mucous. As the infection continues, not only are edema and acute inflammatory cells present in the submucous tissues (figs. 4 and 5), but other changes occur, such as extravasation of fibrin, fibrinoid degeneration of the connective tissue and lymphatic and capillary thrombosis. Simultaneously, the infection may cause necrosis of the epithelium, and exudate, fibrinous or fibrinopurulent (figs. 6 and 7), may be discharged onto the surface and become intimately mixed with the mucus which is being secreted. Farber [2] aptly described the most striking change as a diffuse acute cellular infiltration, with destruction of the walls of the larynx, trachea and bronchi; he compared the histologic picture to that of a cellulitis of the skin characteristic of streptococcic infection. He also described the surface fibrinous and fibrinopurulent exudate, with destruction or masking of the epithelium.

It is apparently the mixture of mucus, fibrin, polymorphonuclear leukocytes and degenerated epithelial cells which makes the typical gummy, ropelike exudate and the crusts (fig. 7).

The mucous glands and excretory ducts seem to offer moderate resistance to the infection (figs. 4 and 5) and hence do not appear to be altered anatomically early in the disease. As the disease progresses to its later and more severe stages, however, sufficient damage may be done to these glands themselves to cause various degrees of degeneration and necrosis (figs. 6, 7 and 8). When sufficient glandular damage has occurred, no further mucus is secreted, and gray fibrinous or fibrinopurulent exudate is discharged on a necrotic surface, producing the dry, glazed appearance noted grossly at bronchoscopy and at autopsy (note the carina [tracheal bifurcation] in figure 6 and also note in figure 7 a microscopic section taken from the carina).

Apparently this sustained glandular integrity and function, as judged from the bronchoscopic picture, and the presence of relatively little anatomic glandular change, as compared with that of the surrounding tissue, until noticeably late in the disease, are somewhat different from the changes which occur in diphtheria, in which, according to

Councilman, Mallory and Pearce,[12] the glandular necrosis is almost specific and may take place with little damage to the surrounding tissue. The principal difference, however, is in function, with undoubted stimulation in laryngotracheobronchitis and suppression in diphtheria, the suppression being possibly due to the action of the soluble toxin in diphtheria.

Fig. 5.—Deep tissues of trachea with edema and marked acute cellular infiltration; × 125. Note the comparative lack of degeneration in the mucoserous glands with beginning degenerative change in the excretory duct on the left, which apparently contains mucus.

12. Councilman, W. T.; Mallory, F. B., and Pearce, R. M.: A Study of the Bacteriology and Pathology of Two Hundred and Twenty Fatal Cases of Diphtheria, J. Boston Soc. M. Sc. **5**:139-319 (Dec. 18) 1900.

The ropelike secretions and the dried crusts cause partial or complete obstruction to the bronchi (fig. 9) and to the bronchioles, with resulting atelectasis and compensatory emphysema or obstructive emphysema, the type depending on the degree of occlusion. Spontaneous pneumothorax may occur from rupture of an emphysematous bleb. Pulmonary edema (fig. 10), interstitial pneumonia (fig. 11), lobular pneumonia (fig. 12) and septicemia are common complications in fatal cases.

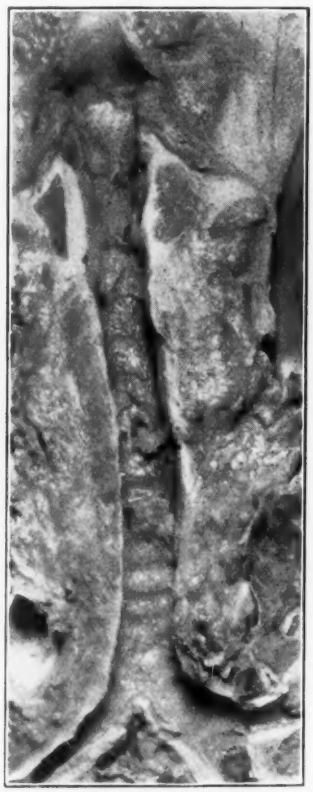

Fig. 6.—Gross specimen of larynx and trachea, illustrating a late stage of laryngotracheobronchitis, showing gummy, crusted exudate in the larynx and in the tracheobronchial tree. Note the glazed appearance of the lower end of the trachea at its bifurcation. Microscopic section of this area is seen in figure 7.

TREATMENT

There are few diseases that require more unremitting and meticulous vigilance and a more adequate armamentarium if the appalling mortality that has been so frankly reported by foremost authorities is to be lowered. One can readily surmise what the unreported mortality

may be under less favorable circumstances. In our earlier years, our treatment can perhaps best be described as sketchy. We were frankly bewildered and worried. We debated as to whether we should intubate, tracheotomize or let nature take its course aided only by steam inhalation and our prayers. The results seemed much the same with all methods. Probably some of those patients who got well with intuba-

Fig. 7.—Carina with acute diffuse cellular infiltration of its walls, fibrinous to fibrinopurulent surface exudate, necrosis of the epithelium, submucous extravasation of fibrin, fibrinoid degeneration of the connective tissue and destruction of the glandular elements; × 90.

tion alone were not truly affected with tracheal and bronchial involvement and their cases should not be included in our series. Only on that assumption, in the light of our later experience, can we explain the fact that more of our patients recovered with intubation than with

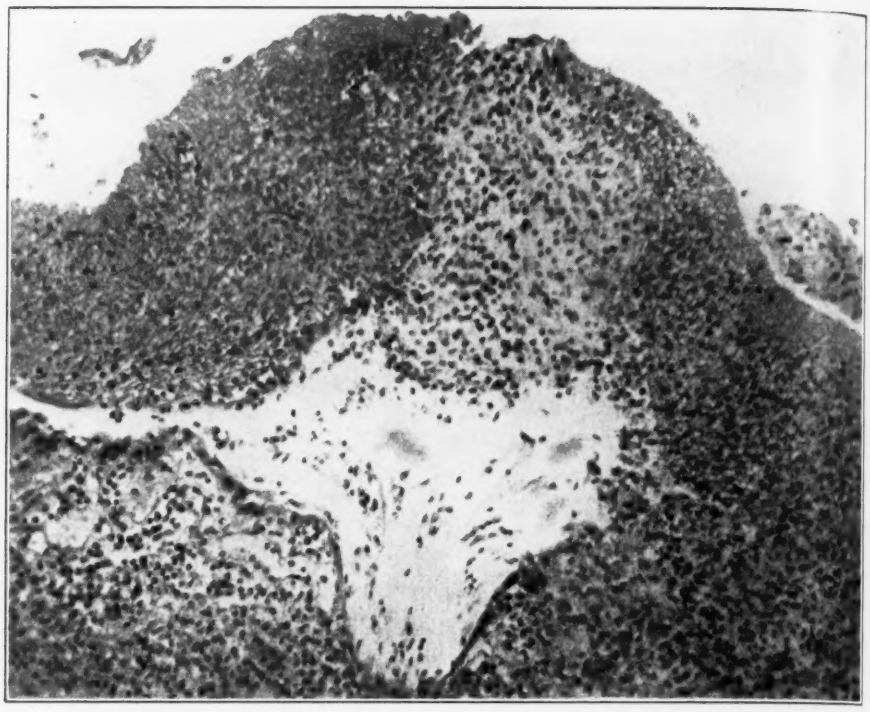

Fig. 8.—Degeneration of the mucous membrane of the ostium (mouth) of an excretory duct of tracheal mucous glands; × 160. Note the thinning and elevation of the fibrinopurulent surface exudate suggestive of recent function of the duct (other such areas have been observed).

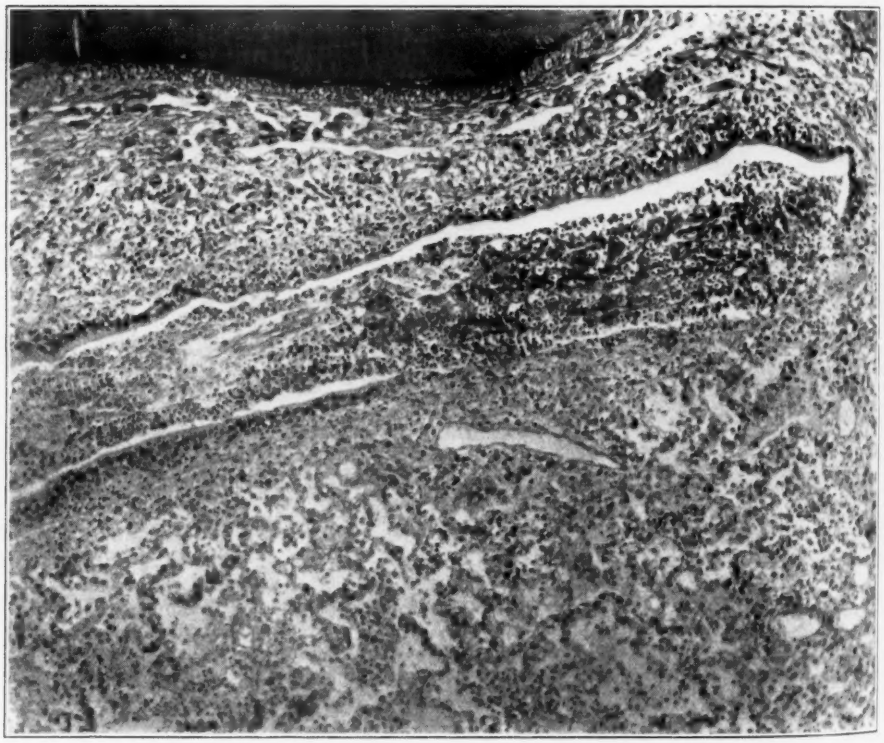

Fig. 9.—A plug composed of polymorphonuclear leukocytes, mucus and fibrin in a small bronchus; × 90. Note the infiltration of the bronchial and alveolar walls with polymorphonuclear leukocytes, as well as the occasional alveolar content of leukocytes.

tracheotomy. As we look back, we feel that some of our unfortunate results were due to inadequate follow-up treatment, especially in those cases in which tracheotomy had been done. Not until the latter part of 1935 did we feel that we were on a firmer and more rational basis. At that time a bronchoscopist came to us who has been easily and constantly accessible, and shortly thereafter a friend of the hospital pro-

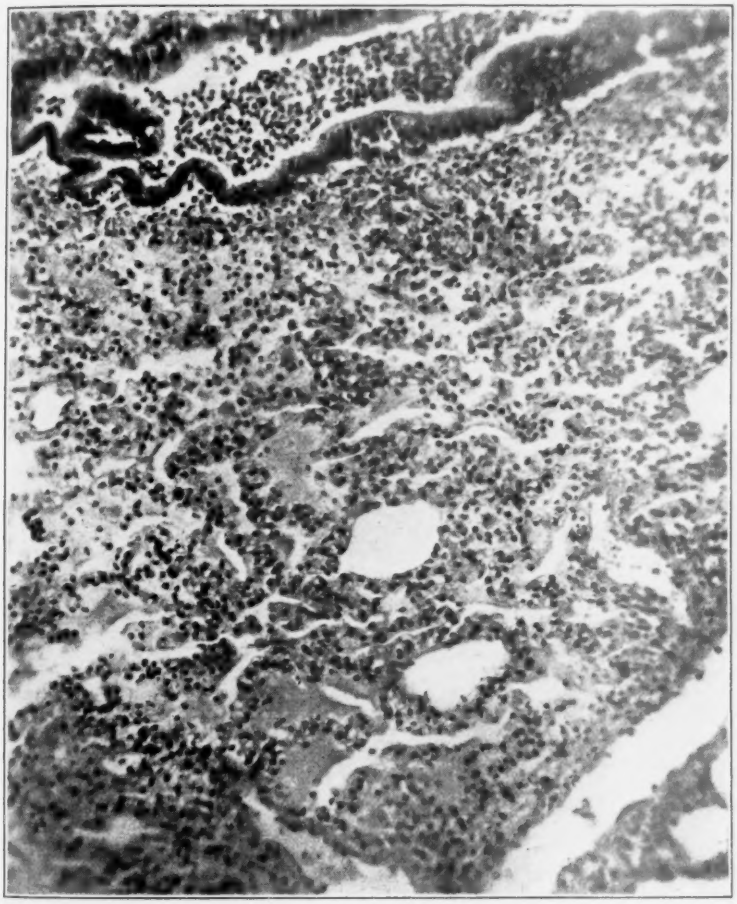

Fig. 10.—Showing a purulent bronchial plug, partial alveolar collapse and edematous fluid within alveoli; × 160.

vided us with an adequately equipped bronchoscopic unit. Since our present equipment and mode of attack seem fully to meet our needs, as we see them at present, they will be used as the basis of the discussion of treatment that follows.

The ideal setup consists of a fully equipped bronchoscopic unit; a readily accessible bronchoscopist, with one or more experienced

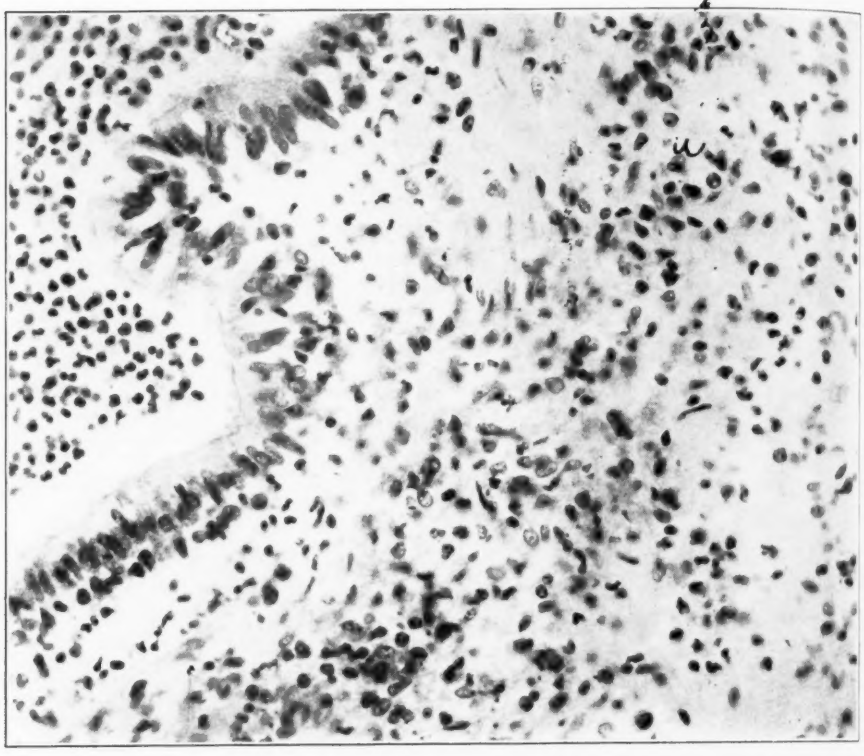

Fig. 11.—Showing a purulent bronchial plug and inflammatory cells (polymorphonuclear leukocytes) in the bronchial and alveolar walls; × 325.

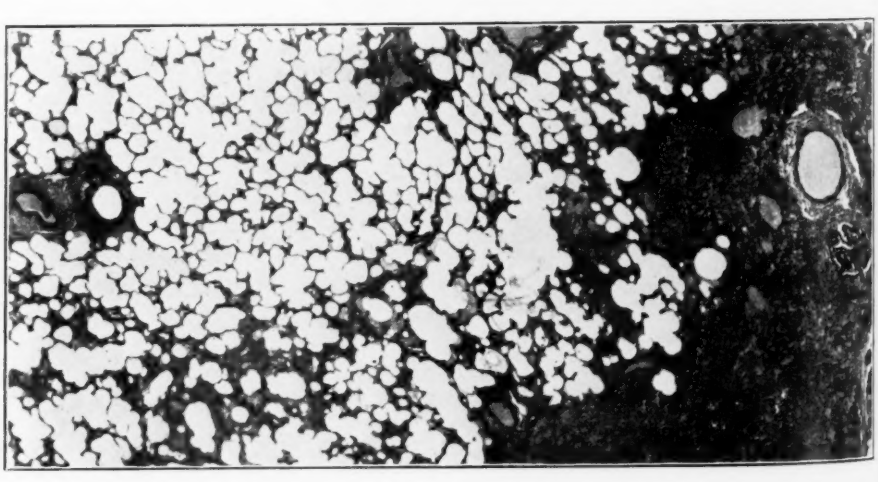

Fig. 12.—Lobular pneumonia, interstitial pneumonia and moderate emphysema; × 20.

assistants and a specially trained nurse for the operating room; at least two special nurses, one constantly on duty with the child, who are experienced in the handling of such patients and know when to recognize alarming symptoms that call for intervention; interns and residents on immediate call, and a pediatrician who, together with the intern, the resident and the bronchoscopist, knows how to evaluate the symptoms and physical signs that result from the sudden changes which occur so frequently in the chest; a room supersaturated with moisture, moderately warm; oxygen; a suction apparatus for aspirating through the tracheotomy tube in patients who have been tracheotomized, and, of greatest importance, cooperative teamwork on the part of those involved.

When the child enters the hospital, he is at once sent into the warm, vapor-saturated room and is kept as quiet as possible. If the condition is at all alarming, the bronchoscopist is called at once. In any case, he is notified and located so that he can be called on short notice. If the condition seems immediately threatening, the oxygen tent can be used as an intermediate step, or intubation can be resorted to, until the bronchoscopist arrives. In one instance a deeply cyanotic infant who seemed moribund was saved by the immediate use of a Mosher life saver, kept in place until bronchoscopic relief could be obtained. In cases in which the disease is advanced, with obstruction in the trachea and in the bronchi, neither the life saver nor the intubation tube would be of much, if any, help. In all cases of serious illness, direct laryngoscopic and bronchoscopic examination and bronchoscopic aspiration are made. These procedures exclude the possible diagnosis of laryngeal and tracheal diphtheria and give immediate relief. Cultures are made from the material taken from the throat and from the aspirated material. If the severity of the involvement warrants it, as shown both by the general condition of the child and by the bronchoscopic examination, a low tracheotomy is done at once, with the bronchoscope in place to facilitate operation as well as to insure an unobstructed passage for air. Prompt temporary relief usually follows aspiration and tracheotomy.

The child is returned to the warm, vapor-saturated room and is disturbed as little as possible. It cannot be emphasized too strongly that a child, especially an infant, who has been robbed of sleep and is exhausted from struggling for air, needs rest and should be spared all those needless medical examinations and details of nursing care to which he is too often subjected unless this point is stressed. The margin that separates adequate from inadequate respiratory exchange is so narrow, at best, in these little patients that the slightest disturbance causes an overstepping of the threshold, with resulting greater restlessness, an increased struggle for air and further curtailment of much

needed rest. The sleeping child should not be disturbed for anything, least of all for medication that is only presumed to be of value. Any change in the child's condition that calls for relief is quickly recognized by the experienced nurse, as it manifests itself in greater restlessness, a change in color, either to pale gray or to deeper cyanosis, a more rapid rate of respiration and an obviously increased struggle in overcoming the respiratory obstruction. Such symptoms call for aspiration with the catheter and with the suction pump. This is done routinely by the nurse and at times by the intern or by the resident. Occasionally it may be desirable to do this at stated intervals, but, if possible, it should be done only as indications arise, again that the child may be saved all unnecessary interference with rest. If no relief is obtained from simply passing the catheter, one or the other of the main bronchi may sometimes be reached more effectively by tilting the tracheotomy tube to one side or the other. If there is still no relief, and especially if there are physical signs of atelectasis, such as absence or suppression of breath sounds, or bronchial breathing, bronchophony and impairment of resonance, bronchoscopic treatment is indicated; it is imperative if there is displacement of the heart toward the affected side. Only by this method can the thicker exudate and crusts that obstruct the opening into the bronchi be removed, either by aspiration or by means of bronchoscopic forceps. Instillation of a small amount of a physiologic solution of sodium chloride or of a weak solution of sodium bicarbonate immediately preceding aspiration is often helpful, both by a possible stimulation of the cough reflex and by its effect on the secretions.

It is obvious from all this that an experienced intern or resident must be in nearly constant attendance day and night. In some cases of severe illness this rule applies also to the bronchoscopist.

Saturation of the room with warm vapor has several indications. It is a time-honored custom to treat all croupy conditions with warm steam from a croup kettle. There is something of authority, at least to the bystander, in compound tincture of benzoin. Whether it is a true adjuvant in cases of laryngotracheobronchitis may well be left undetermined. In cases of spasmodic croup the warmth itself has always been considered of importance. It does not necessarily follow that the same is true with a condition in which the dominating obstruction is below the larynx and in which spasm of the larynx is absent or is a minor factor. We feel, however, that the temperature of the room should be at least somewhere near 75 F. If steam alone is used to attain the desired humidity, the temperature will rise to a point that is objectionably oppressive to the child and to the attendants. We have found that the desired humidity can be obtained at a lower room tem-

perature by the use of a common room humidifier [13] or by a combination of a humidifier and a croup kettle or a similar device for producing steam. The local effect seems as good as that produced with steam alone, and the general effect on the child is decidedly better. Under normal conditions, the inspired air is warmed and moistened in the nasal passages and in the pharynx. In the tracheotomized child, the air passes directly into the trachea. If it is not warmed, it is irritating; if it is not saturated with moisture, it naturally leads to desiccation and to still greater inspissation of the already tenacious and gummy exudate. Obviously, one may assume that vapor-laden air is a positive factor in liquefying the peculiar exudate; or at least in keeping it in as liquid a state as possible.

It is generally agreed [14] that an abundance of fluid should be administered, in order that a normal water balance may be maintained and bronchial secretion promoted. Water given by mouth has a twofold advantage over water given by parenteral administration, in that it is more effective in combating dehydration and starvation and is less painful and disturbing to the child. Since most patients with these conditions are under 2 years of age, the bottle habit may still be present, may not have been forgotten or may be revived. This would naturally be the method of choice, as compared with the use of a cup or a spoon. A medicine dropper tipped with a short length of catheter, or a Breck feeder, can often be used to advantage, as the child need not be raised in order that he may drink. If an adequate amount of fluid cannot be given by any of these methods, one must resort to subcutaneous, intravenous or rectal administration. In the case of the older child, tap water can often be given to advantage through a rectal tube connecting with a container only a little above the level of the buttocks. In the cases of young infants, fluids, notably a solution of dextrose, can sometimes best be given with a minimum of disturbance and a maximum of efficiency by the continuous drip method by way of an ankle vein, with the leg strapped firmly in place on a padded board. While fluids are of prime importance, the child also needs food in what may be a long siege of illness. Nothing can adequately replace oral feeding, and soft and liquid food should be given as freely as possible. Occasion may arise for recourse to nasal or oral gavage. A final warning may not be out of place: An overabundance of fluids administered parenterally may be as harmful as too little fluid, both as a meddlesome disturbance to the child and as an unnecessary burden to a heart that may already be seriously handicapped by prolonged infection.

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13. We have used a room humidifier made by the American Gas Accumulator Company and sold under the trade name of the Walton humidifier.

14. Jackson and Jackson.[1] Richards.[2]

Drugs play a minor role, if indeed any, in the treatment of laryngotracheobronchitis. Expectorants, such as ipecac, the iodides and ammonium salts, have been advocated by some clinicians. They are, at best, of theoretic and questionable value in this peculiar pathologic condition, and practical benefit from them cannot actually be demonstrated. Because of their objectionable taste they add one more worry to an already harassed child, and, which may be even more important, they may cause him to refuse other fluids. The same may be said of calcium gluconate, which has been advocated as having a favorable effect on laryngeal edema. Possibly the well known specific action in laryngospasm initiated this view. We have tried it in a number of cases and have been unable to satisfy ourselves that it is of any therapeutic value. We feel strongly with Chevalier Jackson [1] that opium and belladonna are contraindicated. As Jackson has emphasized, the cough reflex is benumbed or absent as a result of the disease itself, and opium can only aggravate the condition already present. The only relief that the child can obtain by his own efforts is achieved through coughing up the obstructing material in the trachea and in the bronchi, and it seems irrational to rob him of what he has left of his normal reflex, as cough medicines so commonly do. Belladonna inhibits secretions and thus indirectly causes the exudate to become still dryer and more tenacious. It has, moreover, an unpleasant general drying effect that adds to the child's discomfort. In susceptible persons, as has been amply observed, it may bring about a decided rise in temperature, even when given in small doses.

The course of the disease is usually one of many days, even of weeks, and during all of this time unremitting vigilance must be maintained. It has been our experience that bronchoscopic aspiration and tracheotomy are usually followed shortly by a marked rise in temperature but by relief from serious obstruction for twelve hours or less. Obstructive symptoms then recur. These are more or less constantly present for four or five days or longer. As already stated, minor exacerbations occur frequently that can be relieved by suction; but at any time, without warning, there may arise alarming symptoms of obstruction of a main bronchus by gummy exudate or by crusts, with atelectasis of one whole lung, which can be relieved only by bronchoscopic aspiration or by the use of the bronchoscopic forceps. In more favorable cases there follows a change for the better; the exudate becomes more liquid and is more easily removed, and the indication for suction becomes less frequent. As one of our nurses put it, "we are over the hump." There remains then only the matter of extubation. At what seems the safe time a smaller tracheotomy tube is substituted for the previous one, and this is gradually and increasingly, as condi-

tions warrant, plugged with a catheter or with a rubber stopper grooved on one side. As the child breathes more and more through the nose or mouth and along the side of the tube, complete plugging of the tube is given a trial. If this causes no distress over a period of eight or ten hours, a solid metal instrument of the same shape and caliber is substituted for the tracheotomy tube. If after a like period all is well, this, too, is removed. As Jackson [1] has so forcibly stated, *there is rarely, if ever, any serious trouble in decannulation if the tracheotomy is a low one.*

The course is not always so favorable. When the infection reaches the finer bronchioles and the alveoli, bronchopneumonia enters the picture and adds to the duration and seriousness of the disease, with, however, no necessity for specific change in treatment. Septicemia is probably a fairly common accompaniment or complication. An important item in its treatment is the absence of *repeated* blood cultures that do no good and again add to the child's distress. Even more can be said against repeated blood counts, except those made on occasion to determine the degree of anemia. Blood transfusions are indicated if the patient becomes seriously anemic, if the course of the disease is unduly prolonged or if the food intake is inadequate. In none of our 12 patients in 1936 did we feel it necessary or desirable to resort to this procedure. The use of convalescent streptococcus serum is relatively harmless and deserves a trial. It has seemed to us beneficial in other streptococcic infections, even when a demonstration of type identity was lacking. Though in less than one half of our cases was a culture positive for Streptococcus haemolyticus, even after repeated cultures of both material from the throat and bronchoscopically aspirated material, we feel that the pathologic and endoscopic changes point strongly to a single primary cause and that this is probably a streptococcus. For this reason sulfanilamide naturally forces itself into the picture at this time and probably deserves a cautious trial in selected cases.

It is evident from all that has been said that we think that tracheotomy is the procedure of choice if operative intervention seems indicated. The question as to whether intubation should either be used as a full treatment or at least be given a trial is apparently finding its own answer. It will be noted from table 1 that in our cases the mortality with intubation alone (38.5 per cent) was only a shade less than the mortality with tracheotomy alone (41.7 per cent). Moreover, in the cases reported by Richards the 5 patients treated by tracheotomy all died, whereas 4 of the 5 patients treated by intubation alone recovered. The explanation offered by Richards [2] probably applies in both instances: "It must, however, be recognized that those cases in

which intubation alone was successful were undoubtedly of a milder nature and did not tend to the downward extension of infection that was so typical of the other patients. In fact, we might be criticized for including them in any series of cases of fulminating laryngotracheobronchitis since they did not develop tracheitis." Since 38.5 per cent of our earlier patients who were treated by intubation alone died, it would seem evident that not all of our cases were of the milder type; but doubtless some of them were. In our earlier years, when intubation was still a sort of traditional hangover from former experience with laryngeal diphtheria, we were rather in the dark as to the state of things in the trachea and in the bronchi. The situation in laryngeal diphtheria is a very different one. The membrane can commonly be removed by suction, or the obstruction can be relieved by intubation. Further, the specific cure by means of antitoxin makes the period of suction or of intubation relatively short. In laryngotracheobronchitis the course is more often prolonged, and even if relief could be obtained there is danger of ulceration of the trachea and of permanent damage to the vocal cords. It will be noted that in 7 of our cases intubation was followed by tracheotomy. Too, it is obvious that intubation will not relieve the obstruction of a supraglottic edema or of one beyond the end of the tube in the trachea and in the bronchi. Laryngeal obstruction is a minor factor in laryngotracheobronchitis. Nor can repeated bronchoscopic aspiration be carried out for an indefinite period, with or without interrupted intubation, without resultant laryngeal edema of such degree that it can be relieved only by tracheotomy. A further obvious advantage of tracheotomy lies in the facility with which suction and bronchoscopic treatment can be carried out through the tracheotomy wound.

The reports of Tolle [5] (1930) and of Baum [4b] (1928) are of especial interest at this point. Both have considered intubation as the operation of choice and have cited their statistics in confirmation of that view. One can only wonder if the explanation offered by Richards may not be pertinent here, all the more since only 9 of Tolle's 22 patients and 7 of Baum's 24 were treated by intubation alone. None of Tolle's patients was tracheotomized alone, and only 2 were both intubated and tracheotomized (with a mortality of 50 per cent), these facts leaving no basis for comparison of the two procedures. Since "16 of the 22 patients required only one suction and 5 only 2," it seems possible that those patients were not in a condition comparable to that of our patients, as all of ours were treated with aspiration at the first examination and were tracheotomized only when the obstruction was of such a nature that we did not believe it could be relieved by intubation or by suction alone. It is interesting, too, that of the 11 patients

treated by suction alone 7 died, the mortality being 63.6 per cent. It will be noted from table 2 that 4 of Baum's 11 intubated patients also required tracheotomy. The objection to tracheotomy offered by Baum, that the air entering the trachea directly through the tracheotomy tube is not warmed and moistened by passing over the mucous membrane of the upper respiratory tract and that the tracheotomy thus leads to greater desiccation of secretions and to the formation of obstructing plugs, hardly seems valid if the child is in the atmosphere of a warm room supersaturated with vapor. We are still in need of an explanation for the 61.5 per cent mortality of Baum's 13 tracheotomized patients as compared with the 30 per cent mortality of our 10 patients in 1936. It

TABLE 2.—*Mortality Among Ninety-Four Patients with Acute Laryngotracheobronchitis in Other Clinics*

	Gittins	Baum	Richards	Neffson and Wishik	Tolle	Total	
Total number of cases with operation	15	24	11	21	22	93	
Mortality	8	10	7	14	11	50	53.9%
Intubation only	0	7	5	10	9	31	
Mortality	0	1	1	5	3	10	32.2%
Tracheotomy only	15	13	5	5	0	38	
Mortality	8	8	5	4	0	25	65.8%
Intubation, then tracheotomy	0	4	1	6	2	13	
Mortality	0	1	1	5	1	8	61.5%
Tracheobronchial aspiration only	0	0	0	0	11	11	
Mortality	0	0	0	0	7	7	63.6%
No operation	0	0	0	1	0	1	
Mortality	0	0	0	1	0	1	100%
Total number of cases of fulminating involvement	15	24	11	22	22	94	
Total mortality	8	10	7	15	11	51	54.3%
Total percentage of mortality	53.3%	41.6%	63.3%	68%	50%	54.3%	

must be borne in mind that Baum's patients were treated ten or more years ago and are therefore possibly comparable to our own series of 14 patients that we tracheotomized in our earlier nine year period, with a mortality of 50 per cent. It is rather obvious that the final chapter has not yet been written and that further observations are necessary for a full evaluation of the many factors that enter into the treatment of this complicated and treacherous disease.

In the earlier days, as already stated, our experience with both intubation and tracheotomy was so unhappy that we sometimes debated whether to interfere at all. And yet the 4 patients that are included in our earlier series, in which there was no instrumentation, all died. One of us (J. B.), of longer experience, had what then seemed a well founded objection to tracheotomy because of the apparent frequency of bronchopneumonia following that procedure. That objection has

largely disappeared, since it is now known that a condition often interpreted as bronchopneumonia in the past is actually obstructive atelectasis, as long ago pointed out by Jackson. We feel convinced, in the light of later experience, that some of our patients that died after tracheotomy would have recovered if we had been able to give them such follow-up treatment as we have been able to give those that came to us in 1936. This applies equally to those that died without operation and to those that died after intubation alone. From this point of view it is interesting to compare our results with those recorded by others and even more so to compare our earlier with our later results, as shown in table 1.

As already pointed out, it is impossible to compare statistics of mortality from different clinics with any degree of accuracy because one cannot estimate either to what extent different series represent cases in which the involvement was of like nature and severity or how far the series are comparable as to interpretation of indications for treatment. Even in a series from a single source, such as ours, comparisons of one period with another cannot from the very nature of things be wholly dependable when one evaluates the efficiency of one line of treatment as compared with that of another. With these limitations fully in mind, we believe that statistics are nevertheless interesting and may be instructive. In a recent paper (1936) the Jacksons[1a] stated that: "the mortality averages 70 per cent," but offered no statistics from their clinic. Reports from other centers both as to methods of treatment and as to end results are given in table 2. The low mortality from intubation alone (32.2 per cent) is again evident; it is probably due to reasons already stated. The high total mortality of patients treated by tracheotomy alone (65.8 per cent) and by both intubation and tracheotomy (61.5 per cent), with a combined mortality of 64.7 per cent, is of special interest in the light of our own experience. It will be seen from table 1 that in our series of 14 patients tracheotomized during the first nine year period the mortality was 50 per cent and that the mortality of those both intubated and tracheotomized was 40 per cent, with a combined mortality of 47 per cent. In 1936 the mortality of a group of 10 patients who were tracheotomized only was 30 per cent, and in 2 patients who were treated by bronchoscopy alone there was no mortality, the combined mortality being 25 per cent. We are convinced that the 10 patients who were tracheotomized after clinical and bronchoscopic examination presented true laryngotracheobronchitis and needed tracheotomy. We are equally convinced that the illness in these cases was more than usually severe, as so often happens when cases are heaped over a short period of time, and that the genius epidemicus did not play into our hands. We feel that the reduction

in mortality in our own series from 50 per cent in the previous nine years to 25 per cent in 1936 was due to the fact that we were adequately equipped to treat the disease in the latter as compared with the former period and that such cooperative teamwork as has been outlined was the important factor in the accomplishment of that result.

SUMMARY AND CONCLUSIONS

Laryngotracheobronchitis is approached and presented rather from the pediatric than from the usual otolaryngologic standpoint. Our report is based on experience with 45 cases over a period of ten years at the Children's Memorial Hospital.

Major emphasis is placed on treatment and its influence on mortality. The clinical, bronchoscopic and pathologic aspects, knowledge of which is fundamental to rational therapy, are considered. Tracheotomy is advocated as the procedure of choice unless relief can be obtained from bronchoscopic aspiration alone. In this report no case has been accepted as one of laryngotracheobronchitis, *for comparative statistical purposes,* unless the patient either was treated by intubation, tracheotomy or suction or died from the disease itself without such treatment.

A reduction in mortality from about 50 per cent in a series of 23 of our patients treated in the years 1927 to 1935 inclusive to 25 per cent in a group of 12 patients treated in 1936 is reported. This reduction is attributed to adequate equipment and to constant cooperative teamwork in the year 1936, as compared with the less effective facilities and methods of the previous nine years. Tabulated reports from other clinics showing a composite mortality of over 50 per cent are submitted.

The treatment now carried out at the Children's Memorial Hospital is presented in detail.

707 Fullerton Avenue.

DISCUSSION AT MEETING OF AMERICAN PEDRIATIC SOCIETY

DR. A. ASHLEY WEECH, New York City: There is one small therapeutic procedure which I learned from Dr. H. G. Stewart and which appears to be of some use in these cases. It does not at all replace the other measures which have been described. The indication for the procedure arises after tracheotomy has been performed and after an obstructing ring of dry membrane-like exudate has collected in the air passages below the tube. In many instances the exudate is so firmly adherent that it cannot be dislodged by simple aspiration. With such cases we have made it a practice to inject by medicine dropper from 4 to 5 cc. of saline solution through the outer tracheotomy tube. If the injection is made quickly during inspiration, the solution will be drawn into the trachea and upper bronchial tree. During the spasm of cough which follows, the solution is aspirated through a catheter. The procedure frequently dislodges much of the dried exudate, with relief of cyanosis and dyspnea.

Dr. Francis F. Schwentker, Baltimore: At Sydenham Hospital, our experience with laryngeal obstruction and laryngotracheobronchitis is completely in accordance with what Dr. Brennemann has said. I should like to emphasize that we believe even more strongly than Dr. Brennemann has indicated, although perhaps not more strongly than he really believes, in the value of high humidity in the prevention of formation of mucus plugs which obstruct the bronchi and require bronchoscopic removal. We think the steam kettle is out-dated and that the mechanical humidifier should replace it, the type of mechanical humidifier which by centrifugal force produces supersaturation, rather than saturation, of air by moisture.

We attempt to produce a real fog in the room where a patient with a tracheotomy tube is being cared for. By the inspiration of this fog at all times the mucus is kept so diluted that the use for bronchoscopy is, I think, considerably reduced.

Dr. Charles Hendee Smith, New York: I am impressed with the fact that a man so careful in his terminology as Dr. Brennemann falls into the error of saying that these patients had atelectasis. Atelectasis is failure of the lung to expand. He is talking about pulmonary collapse.

Note.—See textbooks of pathology by Adami and Nicholas, Power and Hala, MacCallum, Karsner and the Century Dictionary. On the other hand, Boyd, as well as several dictionaries, describes atelectasis as either congenital or acquired.

Dr. Joseph Brennemann, Chicago: We have never used the method of stimulating the cough reflex by injecting a large amount of salt solution. We have found that even a small amount has much the same effect, and it has seemed safer.

The whole subject is a rather large one to cover within fifteen minutes, and many important things have been only touched on or wholly omitted. We believe in having the room supersaturated with vapor. We do not, however, believe that the room should be excessively hot, as it would be if one used only croup kettles. For that reason, we use a simple room humidifier either with or without a croup kettle, so that the temperature of the room is not over 74 or 75 F.

As to Dr. Smith's surprise that I should use the term "atelectasis" instead of "collapse of the lungs," I can say only that usage establishes propriety and that the word "atelectasis" not only has come into common usage but has good dictionary sanction as designating a condition in which the lung is airless owing either to nonexpansion at birth or to the complete plugging of a bronchus after the lung has once been expanded.

I should like to say one final word about the outcome in these cases. We have been able to reduce the mortality in our own cases 50 per cent. I think it is doubtful whether the mortality will ever be reduced to a very low point. Some of the children with this condition will inevitably wear out, become utterly exhausted and die from this alone; a certain number of them have bronchopneumonia, for the development of which the conditions are so favorable; others die of septicemia; a certain number of them undoubtedly die of atelectasis, especially if this is extensive and if it involves both lungs. I think this would be the common cause of death if one did not have an adequate armamentarium of attack such as we have described. Emphysema due to partial obstruction doubtless plays a part, as does also compensatory emphysema that is no longer compensatory. There remain, finally, those cases that have been described in the text, in which there is no longer a removable exudate—in which the velvety red mucous membrane has become replaced by a thick gray coating that can no longer be coughed up or removed through the bronchoscope.

DISCUSSION AT MEETING OF CHICAGO PEDIATRIC SOCIETY

Dr. F. W. Schlutz: Such cases fortunately are rare, but they are among the most dangerous and tragic that one will encounter. I recall particularly my earlier experiences. Even with prompt intubation and tracheotomy, conditions of the type described were fatal in as high a percentage as that mentioned and I think higher. There was a great change in the picture when Minneapolis got

a bronchoscopist. That great center was devoid of bronchoscopists, although there was one in St. Paul. My colleagues and I were not aware of the possibilities of this treatment, or what could be done with bronchial aspiration. This young bronchoscopist acquired a fine technic. To carry out this procedure successfully is a gift. I have known a good many laryngologists, but few seemed to be qualified or willing to give such treatment. I think this is true of Chicago and other centers. When one has access to a bronchoscopist who is extremely skilful with this instrument one has something to be thankful for.

At the University Hospitals we were prepared to take care of patients of this type. I cannot help supporting everything that has been said here as to teamwork and nursing care. It was only after that developed, and after we had good bronchoscopists that we felt safe. Repeated bronchoscopy within twenty-four hours is often necessary. I was impressed by the fact that it was not just the tracheotomy but the ability of this man to aspirate, without much trauma, material which had accumulated and threatened suffocation. This warded off immediate danger and often eventually saved the patient's life. The mortality rate then improved. I repeat that cases of this type are rare, but we save more of the patients now than we did before and have not the dread of the condition that we used to have.

DR. JOSEPH BRENNEMANN: We could give you some illuminating details about stenosis of the larynx following intubation. I think I will let Dr. Holinger answer the question with reference to the possibility of difficult decannulation following tracheotomy.

DR. PAUL H. HOLINGER: In regard to the question of difficulty in decannulation, I may say that it depends on two factors: First, it depends on damage to the larynx, due either to the original infection for which the tracheotomy was done or to the trauma of repeated intubations, which must be done to relieve the dyspnea in acute laryngotracheobronchitis, since the tube becomes clogged and must be changed frequently. It is usually necessary to keep the tube in place a long time, and ulcers of the entire larynx follow. When the tube is finally removed, cicatricial stenosis, which necessitates years of therapy, results.

The second factor is the position of the tracheotomy tube. If a low tracheotomy is done, with avoidance of the all-important cricoid cartilage and laryngeal structures, stenosis of the larynx is unlikely, and decannulation will be simple once the original inflammation has subsided. Low tracheotomy should be done at all times but may be difficult if any emergency life-saving procedure has to be done in the home or in the admitting room. In the bronchoscopic room, however, an emergency tracheotomy can easily and quickly be converted into a tranquil tracheotomy by the insertion of a bronchoscope through the larynx. The extreme dyspnea is relieved at once if sufficient air and oxygen are piped down into the lungs through the bronchoscope. It is then a simple matter to make a proper incision, expose the trachea and cut down directly on the rigid bronchoscope, inserting the tracheotomy tube as the bronchoscope is removed.

I might illustrate these points by reference to patients whom we have treated in the bronchoscopic clinic in the last two years. The patients in whom tracheotomy alone was done presented no difficulty in regard to decannulation. The patients we are treating now for laryngeal stenosis are those who were repeatedly intubated and then became chronically subject to intubation. In these patients tracheotomy had to be done anyway to permit treatment. These, then, are the ones who are difficult to decannulate, and it may be months or even years before their laryngeal airways are finally reestablished.

TONIC NECK REFLEXES IN CHILDREN

CONSIDERED FROM A PROGNOSTIC STANDPOINT

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Cerebral palsies are commonly described in qualitative terms, such as pyramidal and extrapyramidal, or spastic and athetoid. While these terms may be of value in elucidating the genesis of the motor disturbance and in indicating the applicability of certain forms of treatment to it, they leave much to be desired from the quantitative point of view. Psychologic studies in some measure help to establish an intellectual basis for educational and social plans, but they are in no sense a reliable guide to future motor function. Furthermore, they are of limited validity in their own field when applied to infants under 2 years of age, especially when applied to infants whose responses are impaired by motor difficulties.

During the past few decades investigations on laboratory animals and clinical material have suggested that certain disturbances of motor function in man are of significance as an index of extensive damage, deterioration or malformation of the higher portions of the central nervous system. For a proper understanding of the subject, a review of some of the current concepts of motor function is essential. After this review relevant clinical material will be presented, in an attempt to estimate the significance of certain aberrations of principal motility.

CURRENT CONCEPTS OF MOTOR FUNCTION

Motility in vertebrates may, according to Magnus,[1] be divided into principal motility and voluntary motility. The former, largely under the control of centers in the brain stem, has to do with the maintenance of posture; the latter, mediated through the giant motor cells of the cortex, controls finely adjusted movements of single limbs or parts of limbs. Adequate principal motility is the essential foundation on which voluntary movement can be built. Accepted in the past for the most part as a passive process, posture has been adequately studied only in the last half century, while the more spectacular nature of voluntary movement made it the object of considerable accurate speculation even among the

This work was made possible by a grant from the Commonwealth Fund.

1. Magnus, R.: (*a*) Körperstellung, Berlin, Julius Springer, 1924; (*b*) Lancet **2**:531 and 585, 1926.

ancients (Fulton[2]). The most important contributions to the study of posture were made by Magnus, who in 1924 published a monograph reviewing and amplifying the knowledge of the subject, Sherrington,[3] Beritoff[4] and Schaltenbrand.[5] Most of the matter presented in this review is derived from their work.

Principal motility is, in part at least, the result of three important groups of reflexes: the supporting reaction, the standing reflexes and the righting reflexes. They appear with various patterns of emphasis in relation to the phylogenetic position of the animal exhibiting them, and in response to injury or disease of the nervous system reversion to primitive patterns may occur.

Postural reflexes uncomplicated by voluntary movement are best studied in animals in which transection of the neuraxis is carried out at various levels, i. e., the upper portion of the spinal cord, the hindbrain and the midbrain. That posture is an active process and not a passive one resulting from the arrangement of ligaments about joints is proved by two commonplace observations: First, four-legged animals stand with the upper joints of their legs in positions of more or less flexion; second, neither freshly killed nor anesthetized animals are capable of standing.

The primary requisite of standing is that the flexible limb, capable of a wide variety of movements and positions, shall be converted into a stable supporting pillar. Such a change can be brought about in the limbs of spinal animals by gentle pressure on the pads of the toes, to which the leg responds by extension and fixation of the joints. This reflex, called by Magnus the positive supporting reaction, is partly the result of proprioceptive impulses set up by the stretching of the flexor tendons and partly the result of exteroceptive stimuli acting on the sensory receptors of the pads of the toes; it disappears completely only if these pads are anesthetized and the flexor tendons are cut. The arrangement of the muscles which embrace two joints serves to propogate throughout the limb the stretch reflex set up in the flexor muscles. Through their origin on the medial condyle of the humerus, the

2. Fulton, J. F.: Muscular Contraction and the Reflex Control of Movement, Baltimore, Williams & Wilkins Company, 1926.

3. Sherrington, C. S.: The Integrative Action of the Nervous System, New York, C. Scribner's Sons, 1906; Brain **33**:1, 1910; J. Physiol. **40**:28, 1910; Brain **38**:191, 1915. Liddell, E. G. T., and Sherrington, C. S.: Proc. Roy. Soc., London, s.B **97**:488-518, 1924-1925.

4. Beritoff, J. S.: (*a*) Quart. J. Exper. Physiol. **9**:199, 1915; (*b*) Acta otolaryng. **12**:468, 1927.

5. Schaltenbrand, G.: (*a*) Deutsche Ztschr. f. Nervenh. **87**:23, 1925; (*b*) **89**:82, 1925; (*c*) Development of Human Motility and Motor Disturbances, Arch. Neurol. & Psychiat. **20**:720 (Oct.) 1928.

flexors of the wrist tend to extend the elbow and, in doing so, to set up a stretch reflex in the biceps. This muscle through its long head tends to flex the shoulder and in turn to set up a stretch reflex in the triceps, which thereby counteracts the action of the biceps at both shoulder and elbow. A similar chain of reflexes is set up throughout the shoulder girdle, so that the whole extremity, from its attachment to the trunk down to its lowest segment, is firmly set in a weight-bearing posture by simultaneous contraction of both the flexor and the extensor muscles. This reaction is obviously different from the phasic movements in which the antagonists relax on contraction of their agonists.

With the removal of pressure from the pads of the toes the leg relaxes again, assuming whatever position is imposed on it by gravity and by the tone of its ligaments. This was called by Magnus the negative supporting reaction.

Although the supporting reaction can be elicited in spinal animals, it is fleeting, and, while more or less capable of supporting the animal's weight, it is not sufficiently modifiable to serve alone as a means of standing. Standing occurs only when section of the neuraxis is moved orally to a level just above the entrance of the eighth nerve. The decerebrate rigidity of Sherrington then appears, and the animal can maintain its normal posture by virture of a marked increase in the tone of the antigravity muscles. In most four-legged animals these are the extensors of the vertebral column and of the limbs. In the sloth, which leads an inverted existence hanging from the boughs of trees, the flexors are more involved; in man, whose freely hanging arms must be supported against gravity, the flexors of the arms are involved more than the extensors. Bazett and Penfield[6] showed that in decerebrate cats kept alive for long periods rigidity in flexion may appear, and Pollock and Davis[7] showed that various mutilations of the brain stem can produce a variety of postures.

Animals so decerebrate show two sets of postural reflexes which tend to maintain the upright position. Of these, the simplest are the labyrinthine reflexes acting on the extremities. They appear in response to the position of the head in space and act equally and similarly on all four extremities at once, increasing or decreasing the extensor tone. With the head in the normal position and the snout directed slightly below a horizontal level, extensor tone is at its minimum; with the head upside down and the snout directed slightly above a horizontal level, extensor tone is at its maximum. In all intermediate positions, extensor tone is at an intermediate stage, decreasing as the normal position is approached and increasing as the reverse position is approached. The

6. Bazett, H. C., and Penfield, W. G.: Brain **45**:185, 1922.
7. Pollock, L. J., and Davis, L.: Am. J. Physiol. **92**:625, 1930.

extensor tone produced lasts as long as the exciting posture of the head is maintained. The stimulus is the action of gravity on the otolithic membranes.

In studying the labyrinthine reflexes acting on the extremities it is important to exclude any possible changes in the relative positions of the head and trunk, as these changes are the appropriate stimuli for the second great set of postural reflexes seen in hindbrain preparations. The tonic neck reflexes are asymmetrical in their effect on the extremities, producing opposite changes either in the paired anterior and posterior limbs or in the right as opposed to the left limbs. Extension of the head causes extension of the forelimbs and flexion of the hindlimbs, and flexion of the head results in flexion of the forelegs and extension of the hindlegs. Turning the head about the vertebral axis or inclining it toward either shoulder produces extension of both limbs on the side toward which the jaw is turned and flexion on the side toward which the occiput is directed. These reactions tend to put the animal in positions appropriate for fundamental activities. Extension of the forelegs and flexion of the hindlegs following raising of the head prepare the animal to spring for prey above; flexion of the forelegs and extension of the hindlegs on lowering of the head put it in an easy position for drinking. Extension of the legs on the side toward which the head is inclined or the face rotated tends to compensate for the shift in center of gravity incident to movement of the head toward that side, while flexion on the opposite side frees the legs from the supporting reaction, thereby making them ready to initiate running movements in case prey is seen.

The latent period of the tonic neck reflexes, as of all postural reflexes, is several times as long as that of the phasic reflexes, such as the knee jerk. The response in the extremities is maintained as long as the exciting position of the head in relation to the chest is maintained. In order to study the tonic neck reflexes in pure form, delabyrinthized and decerebrate animals must be used, as either labyrinthine reflexes or voluntary movements might confuse the results. The appropriate stimulus for the reflex is the relative position of the upper cervical vertebrae, and the afferent side of the reflex arc is carried in the posterior roots of the first three cervical nerves. The efferent centers are in the first two cervical segments of the cord.

Though animals decerebrate from just above the entrance of the eighth cranial nerves can stand, they cannot regain their feet if upset. This ability appears when the neuraxis is transected at a higher level, i. e., just above the colliculi, animals so prepared exhibiting what Magnus calls righting reflexes. There are five sets of these reflexes, all cooperating to get the animal into the standing position.

First are the labyrinthine righting reflexes, which keep the head in its normal position in space. By virtue of these reflexes, which originate in response to the effect of gravity on the otolithic maculae of the labyrinth, a decerebrate and therefore blind animal will keep its head in the position normal for the animal.

Second are the neck righting reflexes acting on the body, which tend to keep the body in line with the head. Since by virtue of the neck righting reflexes the head is brought into the normal position, these reflexes in animals tend to bring the body into the ventral position.

Third are the body righting reflexes acting on the head, which, as a result of sensations of pressure set up by the ground in the portion of the body resting on it, tend to orient the head in the normal manner. By virture of these reflexes a decerebrate and delabyrinthized animal if laid on the ground on its side will turn its head to the normal position; but if now a weighted board is placed on the upper side of the animal, the head assumes a position in line with the body.

Fourth are the body righting reflexes acting on the body, which tend to keep the body in the normal position in response to exteroceptive impulses set up by the pressure of the supporting surface against the body.

All four of these sets of righting reflexes are mediated by centers in the brain stem, but the exact locations of these centers are as yet in doubt.

The fifth set of righting reflexes consists of the ocular righting reflexes, which are not seen in decerebrate animals since they are mediated by structures in the forebrain. By virtue of them the head of an animal is held in the normal position. They can be demonstrated in delabyrinthized animals which are blindfolded and held free in space. Under these circumstances the animal's head will assume the dependent position imposed by gravity. When the blindfold is removed and the animal sees a familiar object, the head is brought at once into the normal position.

The whole subject of postural reflexes, especially as they occur in man, is in a state of rapid development. Many conclusions based on attempts at exact localization of the centers involved, conclusions which were accepted a few years ago, have been challenged, and further hints of undescribed reflexes and of their mechanism are appearing.[8]

In intact animals the postural reflexes tend to appear and disappear according to the phylogenetic position of the species investigated. Tonic neck reflexes acting on the extremities occur even in such primi-

8. Rademaker, G. G. J.: Das Stehen, Berlin, Julius Springer, 1931. Ingram, W. R.; Ranson, S. W., and Barris, R. W.: The Red Nucleus, Arch. Neurol. & Psychiat. **31**:768 (April) 1935. Keller, A. D., and Hare, W. K.: Am. J. Physiol. **105**:61, 1933. Langworthy, O. R.: J. Comp. Neurol. **62**:333, 1935.

tive vertebrates as the frog (Beritoff [4b]). Any one watching a cat drinking milk from a saucer can note the flexion of the forelegs and the extension of the hindlegs that occur when it lowers its head to the milk. A piece of meat held a few feet above its head causes the animal to lift its head, extend its forelegs and crouch with its hindlegs, the position assumed being the most favorable one for reaching or springing toward the prey. When it observes a mouse or other moving prey at one side, the cat turns its head to that side and stands largely on the legs of that side, with the opposite foreleg slightly flexed in readiness for the first step in pursuit of the prey. Intact adult monkeys show tonic neck reflexes irregularly, and adult healthy human beings, never. In intact animals of species normally showing tonic neck reflexes, active voluntary movements of the head are as potent in calling forth such reflexes as are the passive movements imposed on decerebrate animals.

Many familiar examples of the activity of righting reflexes could be given, but a few must suffice. They are readily seen if a large four-legged animal, such as the horse, is observed while getting to its feet from the lateral position. First the head is swung into the normal upright position; the body follows, sometimes with the shoulder girdle preceding the pelvis, and when the body is in the ventral position the animal gets to its feet. The essential movement in this method of arising is the rolling to one side and then to the belly; it was called by Schaltenbrand the quadrupedal method of arising. Most Americans are familiar with the perversion of the neck righting reflex which enables a man to throw a steer flat on its side by twisting its neck, using the horns as levers.

The objections to applying to man the conclusions derived from animal experimentation were summarized by Schaltenbrand [5e] as follows: First, although the same structures are demonstrable in the nervous system of man and of animals, there is often a difference in the cellular makeup of these structures, especially in certain of the nuclei of the midbrain. Second, man's motility differs considerably from that of four-legged animals, and, though he is generally considered to have descended from them, one does not know his phylogenetic relation to the forms extant. In the third place, traumatization of the brain is followed by the temporary, more or less widespread interruption of function known as shock, which in the lower animal lasts only for hours or minutes, in monkeys for days or weeks and in man for unknown periods. This may lead one to underestimate the function of the subcortical gray matter, especially in man. Finally, a portion of the function restored after trauma may be foreign to the part then carrying it on as an emergency function.

With these objections in mind, Schaltenbrand carried out extensive observations of the principal motility in man and found that there was

a rather readily demonstrable succession of stages in the maturation of the fetus, infant and child during which some of the foregoing phenomena were present. According to Magnus, Minkowski made observations on human fetuses (between 8.5 and 23 cm. long) obtained by cesarean section, with local anesthesia, between the third and the fifth month of pregnancy. He was able to demonstrate rather irregular postural responses to changes of the position of the head in relation to the body. These responses were maintained as long as the given position of the head was maintained. He was unable to demonstrate any tonic labyrinthine reflexes acting on the extremities.

In examining twenty-six newborn infants Magnus was unable to demonstrate tonic neck or labyrinthine reflexes in any of them. Schaltenbrand, on the other hand, reported the presence of tonic neck reflexes in approximately 10 per cent of a group of normal infants born at full term. He, however, qualified his definition of tonic neck reflexes to signify slight alterations in the position of the shoulders, the shoulder on the side toward which the chin was directed being slightly rotated inward from the rest position and that on the side near the occiput being rotated more or less outward. Further, Schaltenbrand examined his babies as they rested in the palm of his hand with their extremities free in the air, a method which allowed very feeble changes in muscle tone to produce changes in posture, uninterfered with by any possible friction from a supporting surface. Magnus stated that in newborn infants the many voluntary movements and labyrinthine reflexes set up by movement, as opposed to position of the head, obscured any possibility of definite observations.

In describing the postural development of infants, Gesell and Thompson [9] stated that tonic neck reflexes are a prominent phenomenon in placid babies until about the twelfth week of life. They had the advantage of observing infants for whole days at a time and were able to choose their periods of observation with due regard to the state of activity of the baby. They regarded tonic neck reflexes acting on the extremities as a normal postural response which occurs in most babies under 3 months of age unless it is obscured by superimposed voluntary or emotional movements.

Righting reflexes are observable with considerable regularity during the development of infants. Labyrinthine righting reflexes are demonstrable in infants and older children who are blindfolded and held by the pelvis in a variety of positions free in the air. Schaltenbrand described and illustrated neck righting reflexes in babies a few months of age. If the baby is placed on its back and the head turned to one

9. Gesell, A., and Thompson, H.: Infant Behavior: Its Genesis and Growth, New York, McGraw-Hill Book Company, 1934.

side the body follows, and not merely passively, for the turning of the shoulder to follow the head is aided by active swinging of the pelvis and of the legs to the other side. Struggling on the part of the baby is often precipitated by a physician's interference with this reflex, as when in attempting to examine the ears of an infant a few months old he turns the baby's head without allowing or causing the body to follow.

A special form of neck righting reflex was reported by Landau,[10] who observed that infants in their second year supported under the chest by one hand strongly extend their necks, arch their backs and extend their extremities. If now the head is passively flexed, the extension in the other portions of the body vanishes, and the baby folds up almost like a clasp knife.

Another special reflex, the exact relationship of which is not clear, is the Moro reflex,[11] by virtue of which the four extremities of a baby are thrown into sudden rigid extension if the supporting surface on which they lie is suddenly jarred or shaken. It is normally present in infants for about the first three months of life.

As babies develop they gradually learn to gain their feet by the quadrupedal method. First they learn to roll over from the supine to the prone position. At this stage they sometimes object seriously to being kept on their backs and insist on sleeping face down. Then they learn to get up on hands and knees and finally to rise to their feet, pushing themselves into the upright position by their hands. Modifications of this primitive method of arising then develop: The child rolls onto its side and pushes itself into the sitting position, at first using both arms and later in life only one arm. From the sitting position the child gains its feet in the adult manner. Finally, when about 5 to 7 years old, the child learns to get up in the symmetrical adult manner by sitting up from the supine posture without any lateral movement. (Any important weakening of the trunk muscles will cause a persistence or reversion to the quadrupedal method of arising.)

In adult man ocular righting reflexes are probably the most active of the postural reflexes. One need only remember the aviators who, on emerging from a cloud bank, have found themselves flying upside down, to realize how unreliable are man's labyrinthine righting reflexes. That other righting reflexes occur in man is undeniable. For instance, a healthy adult man is able to stand in the Romberg position, but as soon as he loses his ocular righting reflexes by closing his eyes and his body righting reflexes through tabes, he becomes helpless.

Schaltenbrand studied in subjects of various ages many postural reflexes, both those of the continuing tonic sort and those which are

10. Landau, A.: Monatschr. f. Kinderh. **29**:555, 1924.

11. Moro, E.: München. med. Wchnschr. **66**:230, 1919.

ephemeral responses to stimulation of the labyrinths by movement, and published a table by means of which estimates of the neural age of babies could be made.

Reappearance of the primitive forms of principal motility in man associated with pathologic conditions of the brain has been described by many workers. Schaltenbrand outlined under the title of complete decerebrate rigidity a syndrome characterized by extremely primitive postural reflexes, as follows:

1. Increased muscle tone
2. Unequal distribution of tone with predilection for the antigravity muscles
3. Tonic neck and labyrinthine reflexes acting on the extremities
4. The Moro reflex (normally present in babies under 3 months of age)
5. Loss of the righting reflexes
6. Increased tendon reflexes

As evidence of a somewhat less devasting injury to the motor system he proposed a second syndrome, which he called the quadrupedal syndrome:

1. Positive neck righting reflexes (normally present in infants)
2. The primitive form of arising and inability to sit up symmetrically
3. Difficulty in standing upright (not because of local muscular weakness)
4. Impairment of the finer voluntary movements
5. Frequently associated difficulties in speech and mental impairment

He stated that in his opinion the presence of either of these syndromes in older children or adults is evidence of severe cerebral damage. Except in a few cases reported by Schaltenbrand, these suggestions have not been followed up.

Tonic neck reflexes acting on the extremities in man have been reported by a great number of observers, who have found them associated with a variety of pathologic states. The most striking characteristic of the reports is their diversity as to detail and their uniformity as to the broad fact of widespread damage to the higher portions of the brain. Other signs of impairment of the motor functions, either of the pyramidal or of the so-called extrapyramidal type, have usually been present. Diffuse degenerations, tumors at the base of the skull, vascular lesions, infections, inflammations and the results of widespread

trauma have all been represented. Many attempts have been made to localize a specific lesion responsible for the emergence of the postural reflex, but without result.[12]

Simons[13] and Walshe[14] independently and almost simultaneously described a modified form of tonic neck reflexes acting on the extremities. They found that the direction and the character of the associated movements occurring in hemiplegic limbs during voluntary effort on the part of the sound limbs can be profoundly modified by the position of the head relative to the trunk. With the face turned toward the hemiplegic limbs the associated movements are in the direction of extension, and with the face turned toward the sound side of the body the movements are in the direction of flexion. Walshe also stated that the Babinski reaction, which he declared to be the minimal form of primitive flexion reflex, is much more readily demonstrated when the face is turned away from the side being tested.

Though the whole subject of postural reflex mechanisms is still in a fluid state, especially in regard to the determination of the exact neural structures involved, it seems obvious that the reflexes described can be elicited in intact lower mammals and that in intact higher mammals they are increasingly buried by the activity of phylogenetically newer neural machinery. With destruction of this machinery the primitive forms of movement reappear in adult animals, while in immature animals some of the primitive types of movement are not yet abolished. For a more thorough review of the subject the reader is referred to Evans'[15] work, which covers the subject thoroughly up to 1930.

It seems probable, therefore, that the finding of tonic neck reflexes acting on the extremities in older infants or in adults may be interpreted as the retention or the reappearance of a primitive postural reflex released by the absence or the loss of functionally more mature postural mechanisms. When these reflexes occur in newborn infants this interpretation is more in doubt, in view of the conflicting statements of Magnus, Schaltenbrand and Gesell.

Over a period of several years I have been attempting to demonstrate tonic neck reflexes in apparently healthy babies under 3 or 4 months of age in my office and in the clinic. Most of them are so disturbed by their strange surroundings and by the maneuver of turning their heads sharply to one side or the other that their struggles

12. Magnus,[1a] Beritoff,[4b] Kroll, M.: Ztschr. f. d. ges. Neurol. u. Psychiat. **110**:729, 1927. Popow, E.: Monatschr. f. Psychiat. u. Neurol. **73**:101, 1929.

13. Simons, F.: Ztschr. f. d. ges. Neurol. u. Psychiat. **80**:499, 1923.

14. Walshe, F. R. M.: Brain **46**:1 and 281, 1923.

15. Evans, C. L.: Recent Advances in Physiology, ed. 4, Philadelphia, P. Blakiston's Son & Co., 1930, p. 340.

completely obliterate any postural patterns. A few babies, perhaps one in ten, show rotation at the shoulders as described by Schaltenbrand, and still fewer show the well developed pattern of extension of the limbs on the chin side and flexion of the opposite limbs. These are usually placid babies who have been recently fed until satisfied. It seems likely, especially in view of Gesell's observations, that if all babies up to about the age of 3 months could be examined when they are emotionally at rest, most, if not all, would show tonic neck reflexes. Indeed, fragments of the pattern are obvious if one watches well babies of this age in their normal activities.

During the past several years of observations at the Children's Hospital and at the Infants' Hospital in Boston, I have been impressed with the reliability of the Magnus reflex as a sign of severe and widespread cerebral damage. The reflexes have been elicited by placing the patient flat on his back on a table or bed and turning the head so that the chin was directed first over one shoulder and then over the other. Theoretically, with the proper mode of examination the patient would be upright, for in this position the effect of gravity on the otolithic membranes would be the same no matter how the head was turned about the vertebral axis, and thus any labyrinthine influence would be excluded. Practically, this is difficult, and actually any tonic labyrinthine reflexes that might be present would affect all four limbs in the same manner and should be the same whether the head is turned to the right or to the left.

The following cases are all those observed at the Children's Hospital and at the Infants' Hospital in which tonic neck reflexes were noted in the past two years and for which there are adequate records and pictures. Some patients came to the hospital as private patients of Dr. Bronson Crothers, who gave his permission to see and report on them; others were encountered in the wards or in the clinic of the hospital, and one was seen in private practice. Some eight or ten other patients have been observed in the outpatient department, but since convincing records or pictures are lacking for them their cases are not here presented. In no instance would the inclusion of these cases change the conclusions to be drawn.

REPORT OF CASES

CASE 1.—A boy born April 4, 1936, was admitted to the Infants' Hospital at the age of 5 days because of increasing jaundice and convulsions.

His father and mother were living and well. Four previous pregnancies had resulted in a miscarriage, a 12½ pound (5,670 Gm.) stillborn baby and two normal children, aged 2½ years and 1 year respectively when the patient was born.

The patient had been delivered normally after an uneventful pregnancy and appeared well until the fourth day of life. At this time increasing jaundice, failure to nurse and a shrill cry were noted. The following day stupor and generalized convulsions supervened.

On physical examination the baby was intensely icteric and stuporous, the neck was retracted and stiff, the anterior fontanel was full and there was a little oozing from the umbilical stump.

Laboratory studies showed that the urine and stools both contained bile. The blood showed 24,500 white cells on one occasion and 14,700 on another. A direct van den Bergh reaction was elicited. The icteric index was 200. One blood culture produced Staphylococcus albus, and one was sterile. The Hinton test of the blood was negative. The spinal fluid was yellow, with an icteric index of 1½, and contained 45 mg. of protein per hundred cubic centimeters, but it contained no cells and was sterile on culture.

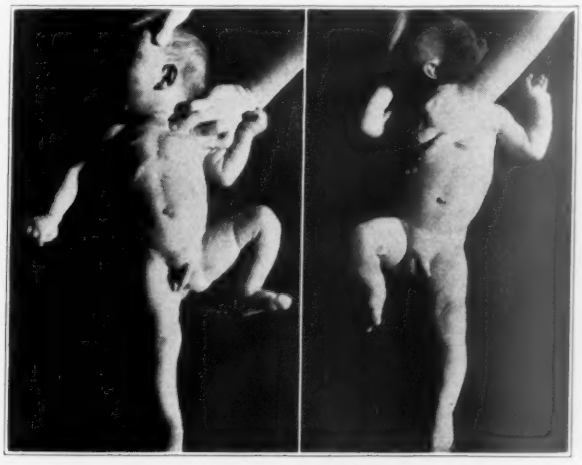

Fig. 1 (case 1).—Tonic neck reflexes.

A diagnosis of probable icterus gravis neonatorum was made, and the baby was given transfusions repeatedly. The jaundice and the convulsions gradually subsided, and the child was discharged at the age of 4 weeks, slightly jaundiced and moderately stiff. No tonic neck reflexes were observed during the acute illness. He was observed for six months in the outpatient department. He did well nutritionally, but generalized stiffness, marked opisthotonos, constant crying at home and failure to develop adequately caused his readmission to the hospital at the age of 6½ months.

Examination showed that he smiled and responded to persons but neither reached for nor held objects. Bilateral internal strabismus was present. His neck was stiff and retracted, and he swallowed with difficulty. His extremities were generally stiff, with increased tendon reflexes and upturning of both great toes on plantar stimulation.

Tonic neck reflexes acting on the extremities were reliably demonstrable, as shown in figure 1. When this infant struggled against the examination he was able to move his extremities only through a narrow range around the position imposed by the tonic neck reflexes.

Encephalograms showed moderate dilatation of the ventricular system and marked enlargement of the subarachnoid spaces inside a head of average proportions.

During the process of taking the encephalograms the baby suddenly stopped breathing and could not be revived.

A baby apparently normal until the fourth day of life showed severe jaundice with cerebral symptoms. After recovery from the acute illness his development was unsatisfactory, especially in regard to motor activity. On physical examination there were evidences of a lesion of the cerebrospinal tract, but in addition there were well marked tonic neck reflexes acting on the extremities, because of which a widespread cerebral lesion was suspected. This suspicion was confirmed by encephalography. The baby's death following the introduction of warm moist air into the enlarged intracranial spaces illustrates the danger of encephalography in the presence of widespread atrophy of the brain.

Fig. 2 (case 1).—Encephalograms showing marked atrophy of the cerebral cortex and moderate enlargement of the lateral and third ventricles.

CASE 2.—A girl born July 24, 1931, was admitted to the Infants' Hospital at the age of 6 months because of convulsions which had occurred frequently since birth. The baby was born about two weeks before term; labor was induced by quinine and lasted fourteen hours. Because the fetal heart beat became irregular during labor the mother was anesthetized and the baby was delivered by forceps. Her weight at birth was 7 pounds and 10 ounces (3,459 Gm.). The child's respirations were established with difficulty, and oxygen was administered during most of the first two days of life. Within twenty-four hours a generalized convulsion developed, for which lumbar and cisternal punctures were done and avertin (tribromethanol) was administered without effect. The convulsions recurred almost daily until the time of admission, except for a period during which their frequency was diminished by phenobarbital. All the convulsions were generalized.

Her development had been slow; her family felt that she recognized them, but she showed no interest in toys and held her head up poorly.

Her family history was not remarkable.

Physical examination showed a well nourished baby who watched people move about and turned toward sounds but showed otherwise no voluntary motor activity

and no interest in toys or bright objects. Save for tonic neck reflexes acting on all the extremities, detailed neurologic examination gave entirely normal findings. Because of the neck reflexes encephalograms were made, which showed marked enlargement of the third and lateral ventricles and of the subarachnoid spaces inside a head of essentially normal proportions.

An infant who during and after delivery showed evidences of a severe cerebral anoxemia was admitted to the hospital because of fre-

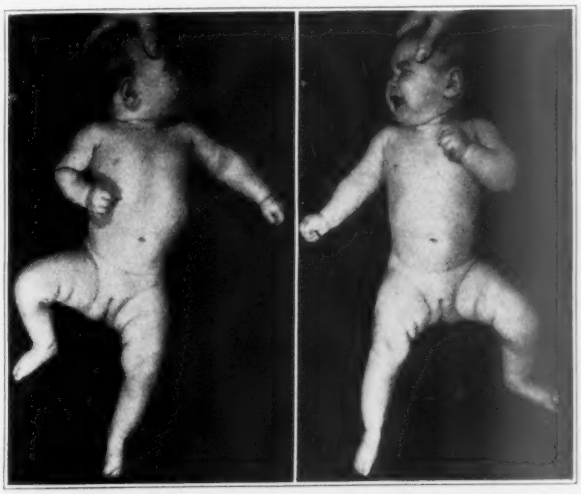

Fig. 3 (case 2).—Tonic neck reflexes.

Fig. 4 (case 2).—Encephalograms showing widespread cerebral atrophy.

quently recurring convulsions. According to the history, her developmental rate had been unsatisfactory, and in the hospital she did not show the activities usual for her age. Save for tonic neck reflexes acting on her extremities, the neurologic findings were not remarkable, but because of these reflexes encephalograms were made, which confirmed the suspicion of widespread cerebral damage.

Case 3.—A girl born April 8, 1933, was admitted to the Children's Hospital at the age of 2½ years because of failure to sit or stand.

She was born at full term. A transverse presentation necessitated version and extraction following manual dilation of the cervix. After delivery, her respirations were irregular, and frequent attacks of cyanosis occurred, and at

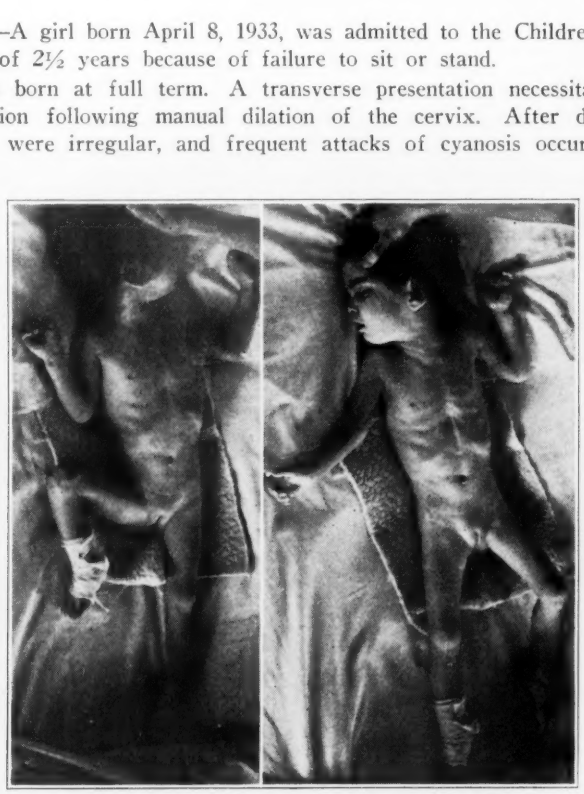

Fig. 5 (case 3).—Tonic neck reflexes.

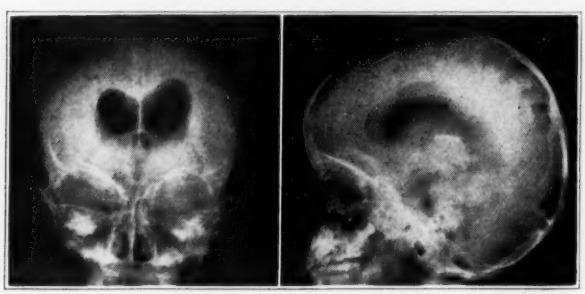

Fig. 6 (case 3).—Encephalograms showing enlargement of the entire ventricular system inside a small cranial vault.

the age of 1 day she had a generalized convulsion and fever. For the next week she was stuporous and could be fed only with a medicine dropper. She never learned to swallow well and has done only indifferently well nutritionally.

Her development was noted to be unsatisfactory at the age of 5 months, and at the age of 2½ years she could not hold up her head, sit up or reach for objects. She seemed oblivious of her surroundings and paid no attention to sound.

Physical examination showed a thin child with constant drooling of saliva and nearly constant aimless athetoid movements of the extremities. The muscle tone in the legs seemed increased. Her tendon reflexes were everywhere lively, with poorly sustained ankle clonus and equivocal plantar reflexes. Tonic neck reflexes, as shown in the accompanying illustrations, were readily demonstrable at all times, and the postural patterns in the extremities were maintained as long as the inducing position of the head was maintained.

Encephalograms showed marked dilatation of the lateral and third ventricles, without any increase in the size of the cranial vault.

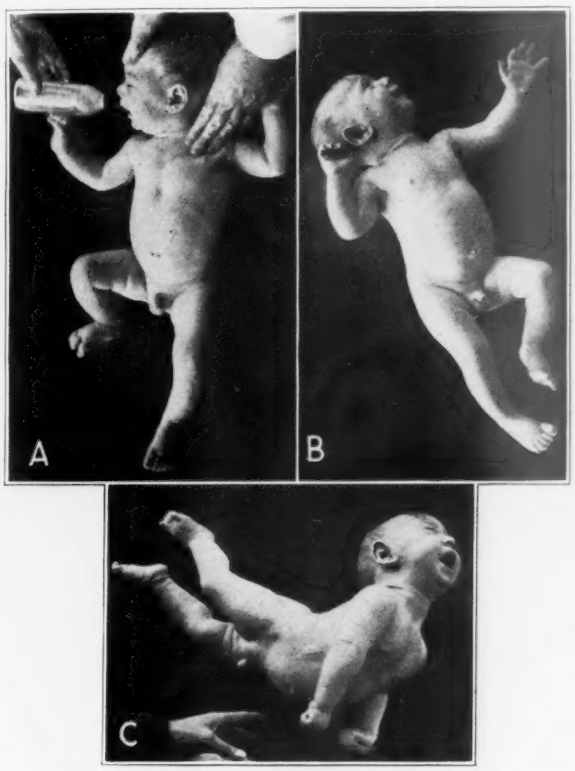

Fig. 7 (case 4).—*A* and *B* tonic neck reflexes affecting the arms; *C*, habitual posture of decerebration.

An infant who after a traumatic type of delivery showed evidences of acute cerebral anoxemia failed to develop in two and a half years to the level of a baby 5 or 6 months of age. Physical examination showed doubtful signs of damage to the pyramidal tract and well marked tonic neck reflexes acting on the extremities. The child had so little voluntary control of the muscular system that she was unable to prevent the full development of the pattern of extension on one side and of flexion

on the other whenever her head was turned to one side or to the other. Encephalograms showed a severe and widespread loss in the bulk of the brain.

CASE 4.—A boy born Jan. 12, 1936, was admitted to the Children's Hospital at the age of 5½ months because of failure to sit up, increasing stiffness and constant crying.

He was born at full term after a long labor. Immediately after birth he seemed extremely ill, with poorly sustained respiration and cyanosis. Within a few weeks he showed increasing stiffness, with retraction of his head and spells of prolonged crying. He had done well nutritionally and had not been otherwise ill.

His development was entirely unsatisfactory; he did not notice his parents or attempt to hold up his head.

On physical examination he paid no attention to light or sound, was stiff and lay on his side in moderate opisthotonos. On being handled he responded by such continual crying and struggling that any detailed neurologic examination

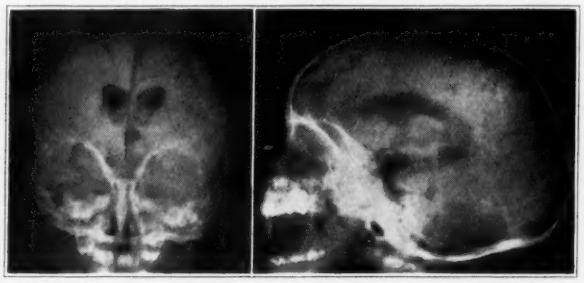

Fig. 8 (case 4).—Encephalograms showing enlargement of the ventricles and excessive air over the cortex.

was impossible. Tonic neck reflexes acting on the arms were, however, usually demonstrable; turning the head to the left produced extension and abduction of the left arm and flexion of the right, while turning the head to the right was followed by partial extension of the right arm and flexion of the left. If the baby struggled too violently against the examination the response to rotation of the head could be entirely suppressed.

Encephalography showed moderate enlargement of the ventricular system and of the subarachnoid spaces over the hemispheres. After the encephalography the baby went gradually downhill; he died with increasing opisthotonos and fever on the ninth postoperative day. The spinal fluid two days prior to death was microscopically and chemically within normal limits and was sterile on culture.

An infant with a history suggestive of cerebral anoxemia at birth failed to develop normally. The posture of decerebration became evident over a period of several months. In addition, there were tonic neck reflexes which could be more or less inhibited by the infant's voluntary or emotional efforts. Encephalography showed obvious and extensive diminution of the bulk of the brain; it was followed in a few days by a fatal termination.

CASE 5.—A boy born July 21, 1934, was admitted to the Children's Hospital at the age of 2½ years because of failure to develop normally. He was born at full term after a long primiparous labor. He was in such bad condition that he was not weighed for several weeks, but he was thought to be unusually large. During the ten days after delivery he had many short, generalized convulsive attacks, was stiff all over between them and did not suck or swallow. After about ten days he learned to take food well, and since then he had done reasonably well nutritionally.

He had, however, never acquired even the most primitive voluntary activities: He could not hold up his head, and he did not respond to people, follow a light

Fig. 9 (case 5).—Tonic neck reflexes acting on the legs.

with his eyes or attend to sound either by turning toward it or by attempting vocalization.

On physical examination he lay motionless on his back unless disturbed, when he made random movements of his four extremities. There was coarse lateral nystagmus of both eyes. His tendon reflexes at the knees and at the ankles were increased, but those at the elbows could not be elicited. His plantar reflexes gave typical Babinski responses on both sides. There was no clonus or contracture. He could not be induced to reach for anything, to hold objects placed in his hands or to take any weight on his feet if held upright.

Tonic neck reflexes acting on the extremities were constantly demonstrable, especially in the legs, which became fully extended on the chin side and flexed on the occipital side. Slight changes in the position of the elbows toward extension on the chin side and flexion on the occipital side usually occurred as well.

An encephalogram was not made, since the family were willing to accept a diagnosis of gross cerebral defect without it and felt unjustified in exposing the baby to its risks.

A child born after a long primiparous labor was stuporous and had many convulsions during the first ten days of life. Thereafter he failed to develop at all. Physical examination at the age of 2½ years showed, in addition to the extreme intellectual defect, evidence of damage to the cerebrospinal tract and tonic neck reflexes acting on the extremities. The family were willing to accept a diagnosis of severe cerebral defect without further investigation.

CASE 6.—A boy born May 27, 1935, was admitted to the Children's Hospital at the age of 20 months because of failure to develop normally. His father and mother and two older siblings were alive and well. He was born at term, after a precipitate labor lasting only about one hour, with the umbilical cord wound tightly around his neck. For a short time there was doubt as to whether he

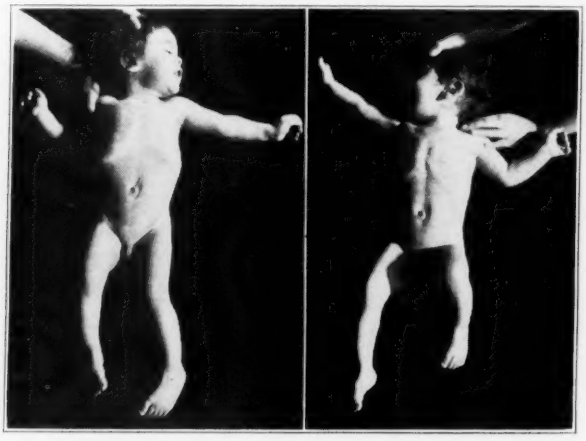

Fig. 10 (case 6).—Tonic reflexes acting on all four extremities.

would live, but after a half-hour respirations were established. During the first six days of life he was listless and sucked and swallowed poorly. He never did well nutritionally.

His development was always retarded as compared with that of his older siblings. A few months before admission he began to distinguish between his parents and strangers and responded with a ready smile to personal attention.

Physical examination showed a small baby responding to speech with a smile. He followed lights and bright objects with his eyes but made no effort to reach or to grasp them. He could not hold up his head, sit or take his weight on his feet. His tendon reflexes were everywhere lively, but his plantar reflexes were normal, and neither clonus nor contractures were found. By rotation of his head to one side or to the other reliable tonic neck reflexes acting on all four extremities were elicited, extension occurring on the chin side and flexion on the occipital side. It was almost impossible for him to suppress the reflexes by struggling against them, and if he did the struggles were simply variations about the imposed pattern, which was assumed again after a few moments of voluntary effort.

On two occasions generalized tonic convulsions were precipitated by crying spells, the result of his resistance to examination, but the tonic neck reflexes were not related to the occurrence of convulsions.

Encephalograms confirmed the clinical impression of gross cerebral defect, showing marked enlargement of the lateral, third and fourth ventricles and excessive amounts of air over the periphery of the brain.

A baby admitted to the hospital at 20 months of age because of failure to develop normally gave a false impression of intellectual competence because of his small size and good social response. The outstanding finding on physical examination was the presence of tonic neck reflexes. These, together with an accurate appraisal of his intellectual status based on age instead of on size, resulted in a clinical impression of severe cerebral defect. This impression was further confirmed by encephalography, which showed a gross anatomic deficit in the bulk of the brain.

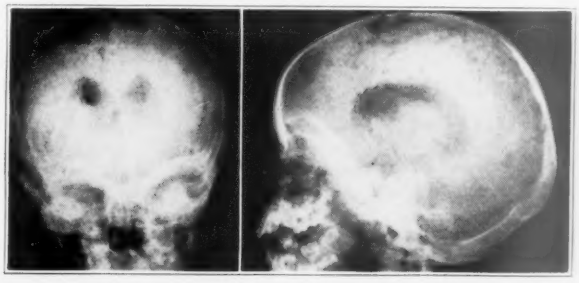

Fig. 11 (case 6).—Encephalograms showing enlargement of the lateral ventricles and some excess of air over the left cortex.

CASE 7.—A boy born April 29, 1936, was admitted to the Children's Hospital at the age of 9 months because of failure to develop normally. His father and mother, one older brother and a twin brother were alive and well. He was the first-born of premature twins and weighed 4 pounds and 12 ounces (2,155 Gm.) at birth. He was extremely cyanotic and was considered to be in poor condition for five weeks, during which time he was kept in an incubator. There was a swelling (hematoma?) over his left parietal region for some weeks after birth. During the first two weeks of life his weight diminished to 3 pounds and 10 ounces (1,590 Gm.) and then began to increase.

His development was always grossly unsatisfactory as compared with that of his twin. He was never able to hold up his head, sit up, reach for objects or play with them but would retain toys put into his hand.

Physical examination showed a rather restless infant with retracted head who followed bright objects with his eyes and responded with a smile to vocal attention. When the baby was held erect, his head flopped into whatever position was imposed by gravity, but otherwise his muscle tone was generally increased. His tendon reflexes were everywhere lively, but his plantar reflexes were normal, no clonus was demonstrable and there were no contractures.

Tonic neck reflexes as expressed in postural change in the extremities were irregularly demonstrable. When the child was well fed and emotionally quiet, they were sometimes easily demonstrable; if, on the other hand, the baby was in his usual irritable mood, turning his head produced, as a rule, enough active resistance to abolish the typical pattern. Handling of the extremities and attempts to impose passive movements on them always caused a marked resistance to flexion on the chin side and to extension on the occipital side. This change in tone was maintained as long as the position of the head producing it was maintained. The change in tone persisted particularly in the elbows, where it was difficult to impose passive flexion on the chin side and easy to impose it on the occipital side. Although frequent momentary convulsions were observed in the hospital, no relation between their occurrence and the tonic neck reflexes could be demonstrated.

Encephalograms showed markedly enlarged subarachnoid spaces all over the surface of the hemispheres, especially on the left. No air entered the ventricular system.

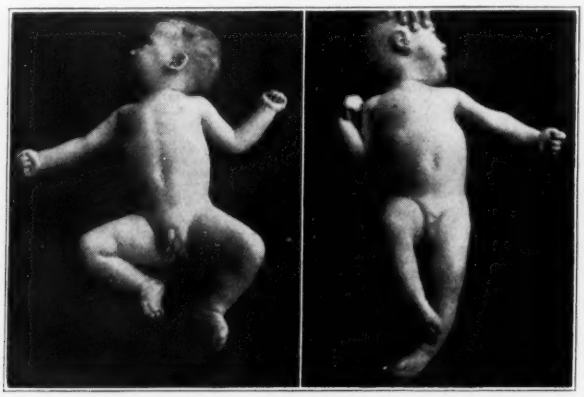

Fig. 12 (case 7).—Tonic neck reflexes acting on the arms. Motion in the photograph shows that voluntary movement of the legs was not suppressed by the reflexes.

An infant aged 9 months was brought to the hospital because of failure to develop after a severe postnatal illness suggesting severe cerebral involvement. His inability to do the things ordinarily done by an infant of his age was readily demonstrable, but his social responsiveness was deceptive. On physical examination, a tendency to retract his head and lively tendon reflexes were the only objective signs found, save for tonic neck reflexes acting on the extremities. The neck reflexes appeared irregularly as compared with the classic pattern but were always apparent if changes in the tone of the extensors of the arms were looked for. Encephalograms showed an obvious deficit in brain tissue, more marked on the left, where a hematoma had developed immediately after birth. Schwartz and Fink [16] showed that

16. Schwartz, P., and Fink, L.: Ztschr. f. Kinderh. **40**:427, 1925-1926.

beneath cranial hematomas localized areas of edema or hemorrhage of the intracranial contents may occur, causing localized damage to the adjacent parts of the brain.

The foregoing histories strongly suggest that in every case natal or neonatal injury of some type, especially that due to anoxemia, affected a nervous system presumably normal before birth, leaving in its wake irreversible and fixed damage. As shown by encephalograms, the damage in every case was widespread and involved the cerebral hemispheres generally. The next group of cases are examples either of degenerative lesions affecting a nervous system normal at birth or of congenital defects of the nervous system, since the histories and the laboratory findings indicate no other cause for the abnormalities. Further examples of children whose presumably normal nervous systems were damaged by factors operative during or immediately after birth will be considered, and the futility of continued attempts to teach voluntary control to such patients will be discussed (cases 14 to 17).

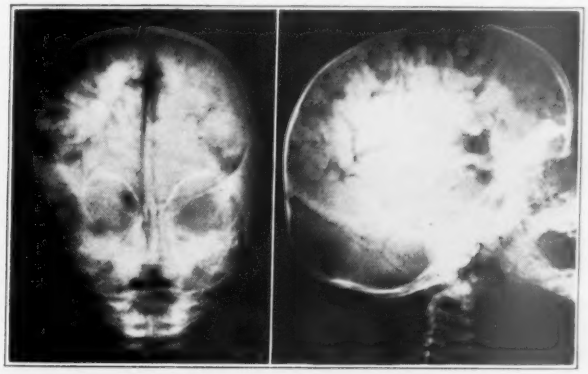

Fig. 13 (case 7).—Encephalograms showing marked enlargement of the subarachnoid spaces over the hemispheres.

CASE 8.—A boy born Oct. 4, 1935, was admitted to the Children's Hospital at the age of 6 months for failure to develop and possible deterioration. His father, his mother and three sisters, aged 9, 7 and 5 years, were living and well. A brother, aged 3 years, had a history similar to that of the patient and was reported to be a helpless idiot.

The patient was born at full term by normal delivery; he weighed 7 pounds (3,175 Gm.). There were no unusual postnatal symptoms, and he had done well nutritionally on breast feeding until the time of admission.

He seemed entirely normal to his family till he was about 5 months of age, when he gradually became less active. He stopped holding up his head, did not respond to visual sitmuli as before and stopped reaching for and holding toys.

On physical examination he was not seen to make any attempt to roll over or sit up. If held upright he could hold his head erect for a moment, but after that it assumed whatever position was imposed on it by gravity. He turned toward a

sudden bright light but paid no attention to lesser visual stimuli. His pupils and extraocular movements were normal, but examination of the fundi showed moderately advanced primary atrophy of the optic nerve, although there was no degeneration of the retina or cherry-red spot. His feet were slightly clubbed. His tendon reflexes were unusually lively everywhere, and his plantar reflexes gave the Babinski type of response. Well marked tonic neck reflexes were

Fig. 14 (case 8).—Tonic reflexes acting on all four extremities.

Fig. 15 (case 8).—Encephalograms showing marked dilatation of the lateral and third ventricles and excessive collection of air, especially over the frontal lobes.

regularly demonstrable, as shown in figure 14, the imposed posture of the extremities being maintained as long as the appropriate position of the head in relation to the trunk was maintained.

The urine, blood cells and chemical composition of the spinal fluid were all normal. Wassermann tests of the blood and of the spinal fluid were negative. No evidence of lead was found on roentgen examination of the long bones.

Encephalograms showed marked enlargement of the lateral and third ventricles and unusually deep subarachnoid spaces over the frontal lobes. It seemed likely that air had not reached the remainder of the subarachnoid space.

The diagnosis was familial degenerative disease of the cerebral hemispheres. Institutional care was suggested.

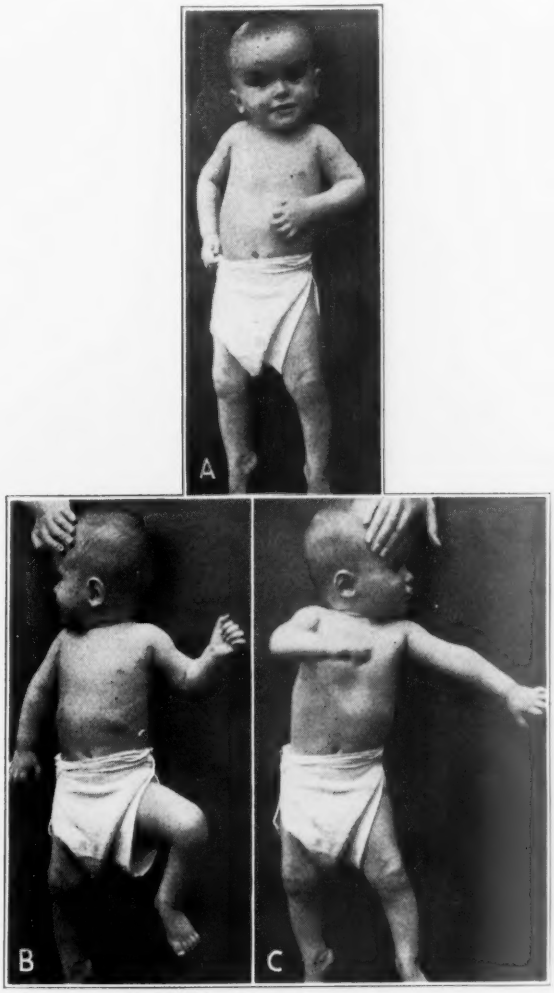

Fig. 16 (case 9).—*A*, the responsive appearance of the baby; *B* and *C*, tonic neck reflexes acting on all four extremities.

An infant who seemed normal until he was 5 months of age subsequently regressed in ability. Examination showed intellectual defect, signs of disease of the cerebrospinal tracts and tonic neck reflexes acting on the extremities. Encephalograms confirmed the suspicion of

widespread cerebral atrophy, thought to be due to a familial type of degeneration of the nervous system. An older brother suffered from a similar disease.

CASE 9.—A boy born March 9, 1936, was admitted to the Children's Hospital at the age of 7½ months because of an abnormally rapid increase in the size of his head. His family history and past history were in no way remarkable. He had developed at about the usual rate and when he was 6 months old was holding up his head, pushing up the front part of his body with his arms when on his abdomen and playing with rattles. During the next month he became less active, and during the two weeks before admission fairly rapid enlargement of his head was noticed.

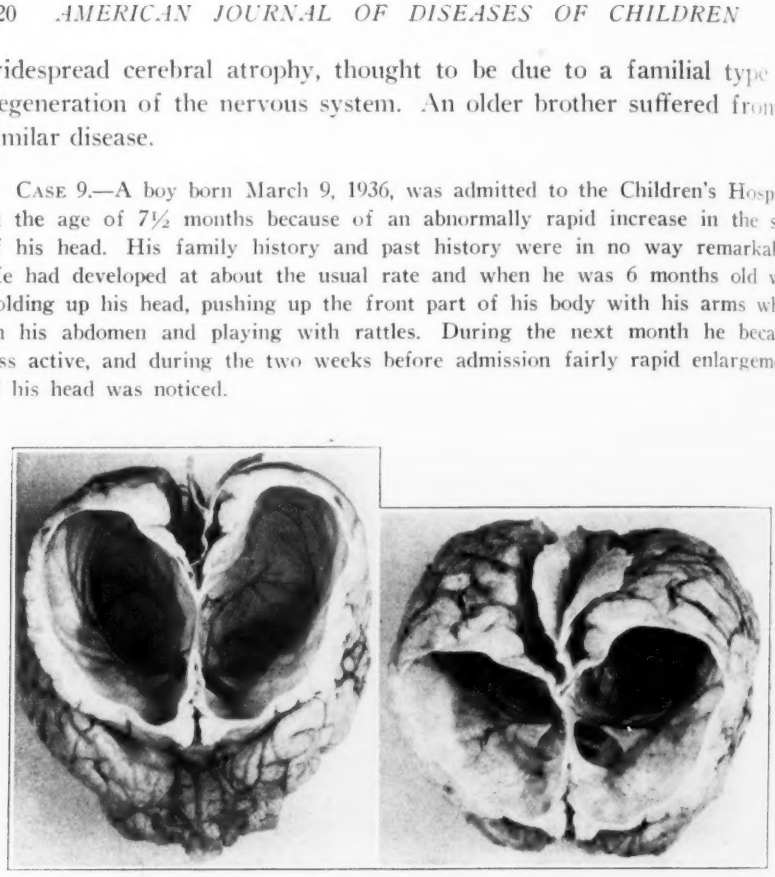

Fig. 17 (case 9).—Coronal section of the brain, showing great dilatation of the lateral and third ventricles and of the aqueduct of Sylvius.

On physical examination he was a responsive but quiet baby with obvious hydrocephalus; his head was 21 inches (53 cm.) in circumference and his chest 18 inches (46 cm.); his anterior fontanel was wide and bulging, and the veins of his scalp were enlarged. Both eyeballs were depressed, and their fundi showed enlarged veins but no papilledema. His tendon reflexes were moderately increased, and plantar stimulation produced upturning of the great toe. Tonic neck reflexes were reliably demonstrated, as shown in figure 16, although this child at that time still possessed a good range of voluntary movement.

Direct ventriculograms done at this time showed enlarged ventricles but a cortex of fair thickness around them. Phenolsulfonphthalein injected directly into the ventricles did not appear in the spinal fluid in sixteen minutes, and only 7 per cent of the amount injected was excreted by the kidneys in three hours.

Suboccipital exploration by Dr. Franc Ingraham revealed a greatly dilated fourth ventricle, the roof of which appeared as a transparent vesicle in the wound. When this ruptured, a gush of cerebrospinal fluid allowed collapse of the brain, and dense adhesions were noted between the pia and the dura about

the foramen magnum. It was hoped that the lysis of these adhesions might improve the cerebrospinal circulation, but the cerebral fluid rapidly reaccumulated, and the infant died about a month later.

Autopsy showed extreme dilatation of the ventricular system, with widespread destruction of brain tissue.

An infant who was apparently normal until 6 months of age showed clinical symptoms of hydrocephalus and became less active during the seventh month. At 7 months he was socially responsive but showed the usual evidences of a lesion of the corticospinal tract and tonic neck reflexes acting on the extremities. Ventriculograms showed a fair anatomic retention of the bulk of the brain, but because of the short

Fig. 18 (case 10).—Tonic neck reflexes acting on the arms. In this baby the tonic neck reflexes were much more evident after active turning of the head than after passive turning of the head.

duration and rapid progress of the disease and because of the tonic neck reflexes it was felt that the volume of the brain was not an accurate measure of cerebral function and that rapidly progressive damage was occurring. Operation failed to check the swift course of the disease, and death ensued in a few weeks.

Case 10.—A girl born July 12, 1935, was admitted to the Children's Hospital at the age of 11 months for failure to develop and convulsions. She was the illegitimate child of parents who were stepbrother and stepsister. Since she was brought to the hospital not by the parents but by her grandmother, much of her early history remained unknown. She was born at full term; she weighed 6 pounds (2,722 Gm.) and seemed normal. Her grandmother had cared for her from the time she was 4 months old; since this age she had vomited a good deal but had gained well. She had never learned to recognize people, to hold her bottle, to hold up her head or to show the usual amount of infantile pleasure

in voluntary movement. She had frequent short periods of jerkiness during which she could not suck or swallow; these the grandmother interpreted as convulsions.

On physical examination she was a placid baby with such marked hypermobility of all joints that she could lie with her face between her feet with no apparent discomfort. When placed on her abdomen she raised her head, but she paid no attention to bright lights or to noises. Her tendon reflexes were normal, as were her plantar reflexes. No tremor, athetosis or rigidity was demonstrable, and no contracture was found. Tonic neck reflexes acting on the arms were readily demonstrable, as shown in figure 18. The position of the right leg in *B* is, of course, not typical and seemed accidental. During examination she had a convulsion of a few seconds' duration, during which her eyes rolled up so that the irides were no longer visible, and she became stiff and tremulous all over.

Encephalography was refused, and the child was placed in the Monson State Hospital, where six months later her condition was reported to be unchanged.

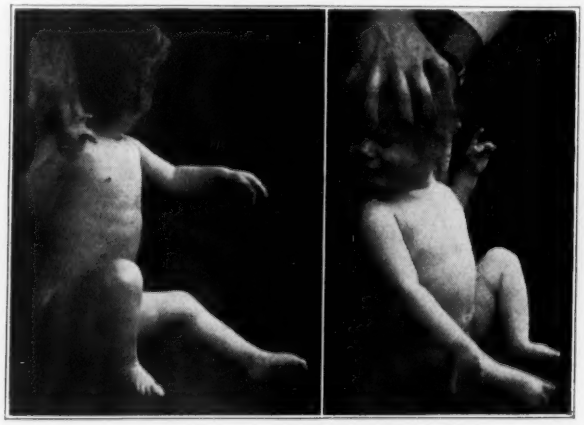

Fig. 19 (case 11).—Tonic neck reflexes affecting the arms and the left leg.

An infant with an incomplete history, the offspring of consanguineous parents, failed to manifest any of the usual activities. In addition, she had frequent convulsions of short duration. The outstanding demonstrable evidence of extensive cerebral damage was the finding of tonic neck reflexes acting on the arms.

CASE 11.—A girl born May 30, 1935, was brought to the Children's Hospital at the age of 19 months because of frequently repeated convulsions. Her father and mother and two older siblings were alive and well; there had been no other pregnancies. The patient was born at term after a seven hour labor, weighed 7 pounds and 3 ounces (3,260 Gm.) and had no unusual postnatal symptoms. She always took an average diet well.

Convulsions appeared at the age of 3 months; they were characterized by rolling up of the eyes, drawing up of the legs, generalized stiffness and slight twitching all over. The attacks recurred several times a day for several days and were followed by intervals of freedom lasting a few days.

Her development was unsatisfactory: She did not hold up her head until the age of 11 months; she never gave any definite evidence of vision, and she never learned to hold her bottle or toys, to sit up or to support her weight on her feet.

On physical examination she was obviously grossly defective mentally. The head was small, the greatest circumference being 18 inches (46 cm.). The eyes showed bilateral internal strabismus and irregular coarse nystagmoid movements, and the optic disks were pale and sharply outlined. Her pupils reacted promptly to light. Her muscle tone was in general markedly hypotonic, but if allowed to lie on her side she assumed a position of opisthotonos. Her tendon reflexes were moderately increased, but her plantar reflexes were normal, no clonus was demonstrable and there were no contractures. Tonic neck reflexes acting on her arms were usually present, though the infant was so irritable when disturbed that she fought against them. Even though by voluntary effort she was able to suppress the classic postural change it was obvious when one handled her extremities that those on the chin side resisted flexion more than they resisted extension and that the opposite was true on the occipital side. These changes in tone were maintained as long as the exciting posture of the head was maintained.

Fig. 20 (case 11).—Encephalograms showing symmetrical enlargement of the ventricular system and of the subarathnoid spaces over the hemispheres.

She had an anomaly of the external ear on each side.

Encephalograms showed marked enlargement of all the ventricles and of the subarachnoid spaces over the cortex.

A child with anomalously developed external ears began to have frequent convulsions at the age of 3 months. At the age of 19 months, among other obvious clinical signs of defect of the nervous system, she showed tonic neck reflexes acting on her extremities. Encephalograms showed an extreme deficiency in the bulk of the brain, which was thought, because of the anomalies of the ears, to be also congenital.

Case 12.—A girl born Oct. 20, 1934, was admitted to the Children's Hospital at the age of 27 months because of recurrent convulsions which began at the age of 9 months. Her father and mother and one older sister were alive and well; the second pregnancy had resulted in a still birth following a difficult delivery, and the patient was the result of the third pregnancy. She was born after a dry labor of three hours' duration but seemed normal at birth and did well nutritionally.

Her development was always slow; she did not learn to hold her head up until some time after the age of 9 months. She never learned to distinguish between her parents and strangers, and she never learned to reach for or to play with toys. At the age of 9 months she began to have convulsions characterized by fixation of her eyes, a sudden cry, drawing up of her legs and generalized rigidity lasting one-half to one minute. The convulsions gradually increased in frequency till at the age of 19 months they occurred many times a day.

On physical examination she was obviously a grossly defective child; she had a small head (circumference 18 inches [46 cm.]) and paid no attention to sights or to sounds. She did not hold up her head, sit or grasp objects. Her musculature was hypotonic in general, with moderately increased tendon reflexes but normal

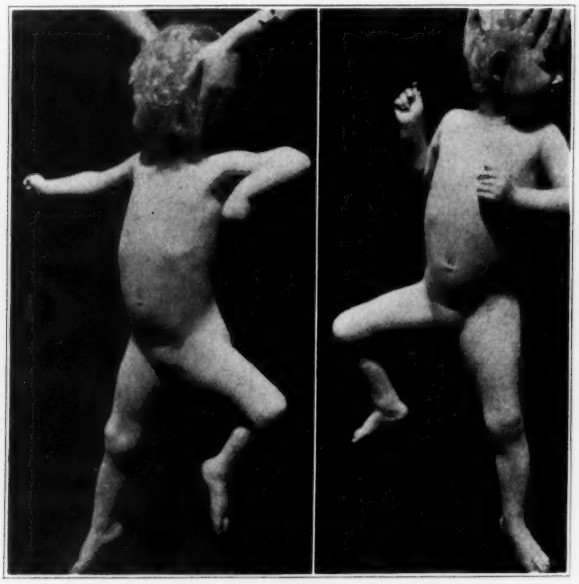

Fig. 21 (case 12).—Tonic neck reflexes affecting the legs and the right arm.

plantar reflexes, no clonus and no contractures. When her head was turned from side to side, well marked tonic reflexes acting on all her extremities were usually demonstrable. If the child was crying and irritable she could suppress them, but if she was placid and recently fed they were striking. When her struggles prevented the tonic changes in the muscles from expressing themselves as postural changes, handling of the extremities showed that in spite of voluntary motion extensor tone was constantly more marked on the chin side than on the occipital side.

Encephalograms showed enlargement of the lateral and third ventricles and an increased amount of air uniformly distributed over the surface of the hemispheres.

A child whose development had never been satisfactory began at the age of 9 months to have convulsions which recurred at frequent intervals. At the age of 27 months she showed in addition to her obvious idiocy increased tendon reflexes and tonic neck reflexes acting

on all her extremities. Although she could by voluntary movement interfere with the postural pattern usually produced by these reflexes, the fundamental changes in muscle tone responsible for the postural pattern were constantly demonstrable. Encephalograms showed an extensive and widespread deficiency in the bulk of the brain inside a small cranial vault.

CASE 13.—A girl born Nov. 12, 1932, was first admitted to the Children's Hospital at the age of 9 months for failure to sit up. At that time there were nine older siblings, all alive and well, and since then two other apparently normal children were born. The patient was born at full term after a two hour labor and seemed normal in every way until the age of 8 or 9 months, when her parents were disturbed because of her failure to sit up.

Physical examination showed a responsive child with a great variety of ill coordinated involuntary movements at all joints, which seriously interfered with

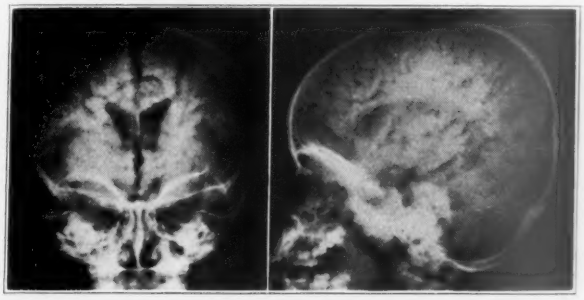

Fig. 22 (case 12).—Encephalograms showing marked enlargement of the lateral ventricles and of the subarachnoid spaces inside a small cranial vault.

any voluntary movement, though she appeared to make an effort to reach for toys. Her tendon reflexes were hyperactive and equal on the two sides; her plantar reflexes were normal.

Because she was responsive an attempt was made to teach her voluntary control by training the muscles over a period of months, but without success.

At the age of 18 months her highest type of response resembled the simple conditioned reflexes ordinarily acquired by a baby of 12 months. At the age of 2½ years she had not learned to sit or stand and could not talk. She drooled continuously. At this time tonic neck reflexes acting on all four extremities were first noted (they had not been looked for previously); these have remained unchanged to the present time. When she was last seen, at the age of 4½ years, her motor ability had not improved in any respect, nor did she show any evidence of mental ability higher than that of the average infant between 1 and 2 years of age.

A child who was presumably congenitally defective showed such a high degree of social responsiveness and so few certain signs of neurologic damage that much time and effort were expended on her by her parents and the hospital in an effort to teach her motor control. The presence of tonic neck reflexes, first noted when she was 2½

years of age, confirmed the impression of widespread cerebral damage created by her failure to profit from muscle training. Her subsequent failure to develop in either motor or mental ability has further borne out this impression.

The foregoing case gives an example of cerebral palsy the severity of which was masked in infancy by the patient's social responsiveness.

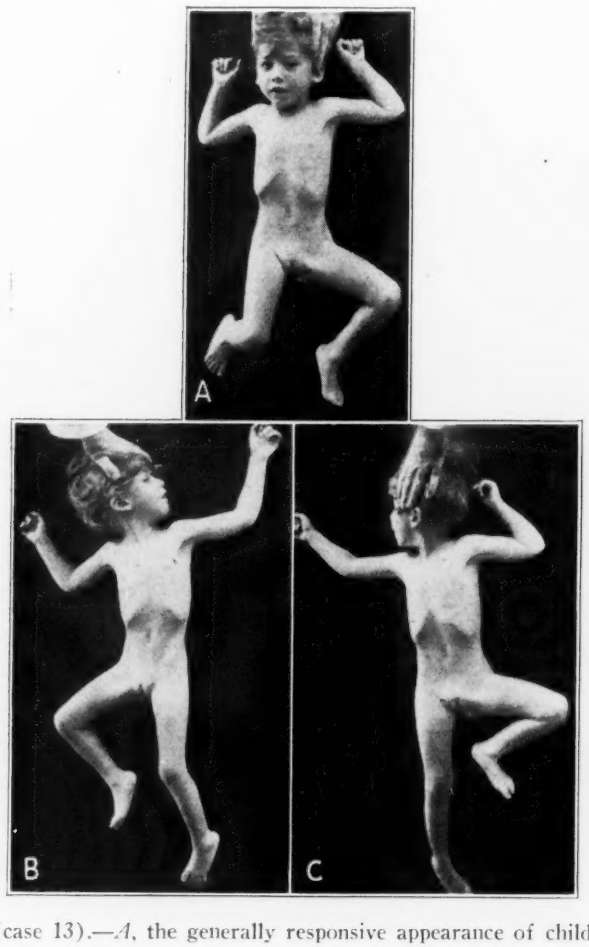

Fig. 23 (case 13).—*A*, the generally responsive appearance of child at the age of 3½ years; *B* and *C*, toxic neck reflexes affecting all four extremities.

Tonic neck reflexes were almost certainly present from birth or soon after; had they been noted and understood, much time and effort would have been saved, and possibly heart-break might have been avoided. In the following group of cases the same sort of attempt was made to teach children with severe cerebral palsy to walk, with complete failure in spite of the spending of much time, money and effort.

CASE 14.—A boy born Aug. 10, 1932, was admitted to the Children's Hospitial at the age of 9 months because of failure to develop normally. He was the first child of healthy parents and was born at full term by low forceps delivery. His respirations were established with difficulty; six hours after delivery nystagmus developed, and he had generalized convulsions which continued for several days. Punctures produced intensely bloody lumbar fluid and slightly blood-tinged cisternal fluid in small amounts, and the baby was given transfusions. He was unable to suck or swallow for some days, feedings being administered by nasal tube during this interval. His temperature was unstable, running up to 102 F. on two occasions during the first week.

After the convulsions ceased he was rigid for several weeks, and then gradually this condition gave way to hypotonia. He did not learn to swallow well, to hold up his head or to sit up. He could reach for and grasp objects unsteadily and learned to distinguish between his parents and strangers when he was a few months of age.

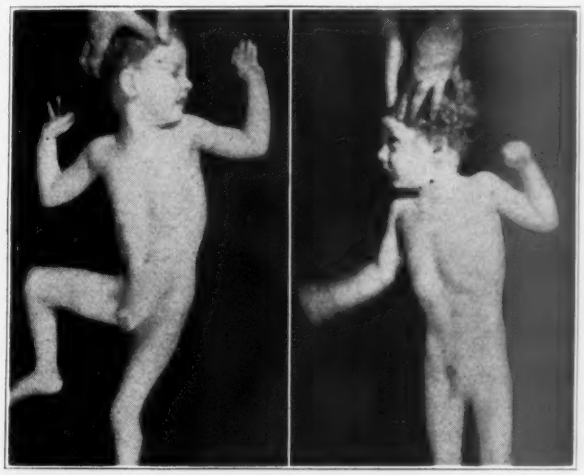

Fig. 24 (case 14).—Tonic neck reflexes acting on the arms and on the right leg.

At the ages of 3 and 4 months he had infection of the upper respiratory tract followed by marked anorexia; otherwise he had been well.

On physical examination he was seen to be a responsive baby with generalized hypotonia. There was external strabismus of the right eye. His tendon reflexes at his knees were sluggish, and no other tendon reflexes were obtained; his plantar reflexes were normal. Tonic neck reflexes affecting both the arms and the legs were readily demonstrable.

He was given intensive physical therapy over a period of two years, with little or no improvement in his ability to combine the action of the great muscle groups into useful movements. He learned to sit in a chair and to stand alone for a moment, but he never learned to take steps without being supported under both axillae. As time passed, it became obvious that his speech was unsatisfactory both in formation and in intellectual content.

A child who in the immediate postnatal period had symptoms of severe cerebral damage failed to acquire normal motor activity. Though

he appeared to be responsive at the age of 9 months, tonic neck reflexes suggested a widespread severe cerebral lesion, a suggestion which has been confirmed by his subsequent lack of progress.

CASE 15.—A girl born April 17, 1930, was first brought to the Children's Hospital at the age of 11 months because of failure to sit up. Her father and mother were well. She was the result of the only pregnancy. She was born at full term after a seventeen hour labor terminated by low forceps applied to the head, which was in the right occipito-anterior position. Respirations were established with difficulty. The child was pale and almost lifeless for two days and was fed with a tube for thirteen days because of failure to suck or to swallow. During the first two days of life there were convulsive twitchings of her face and extremities, and

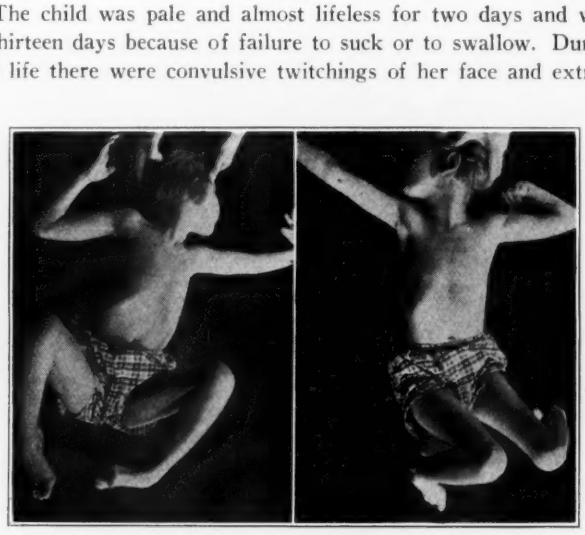

Fig. 25 (case 15).—Tonic neck reflexes affecting the arms and probable neck righting reflex affecting the pelvis and the legs when the chin is directed to the right.

on account of these she was given two intramuscular injections of maternal blood. For the first five weeks of life she was given a sedative to prevent the recurrence of the twitchings.

She did well nutritionally after the first three weeks and had no subsequent illnesses or injuries.

Her development was extremely slow. She did not hold her head up until the age of 2 years; she began to say simple words indistinctly at about the same time. At the age of 3 years she was able to sit with support. At the age of 5 years she could stand for a few seconds if placed on her feet and could reach for and grasp small objects with her right hand but not with her left. At the age of 6 years she put two or three words together and could take a few steps if supported firmly under both axillae. Psychologic appraisal at the age of 5½ years showed marked interest in kindergarten material but no ability to carry learned material over from one day to the next.

At the age of 5 years she began to have cramps in her left arm or leg, sometimes followed by a few coarse involuntary jerking movements without loss of consciousness; and at about the age of 6 years these became frequent severe generalized convulsions, which were followed by rapid deterioration.

On physical examination she always showed generalized hypotonia, drooling and athetoid movements, which were more severe on the left and were increased by voluntary effort. When her extremities were handled, they tended to become rigid, especially when attempts to impose sudden passive movements were made. Her tendon reflexes were rather lively and were equal on the two sides, and her plantar reflexes were normal. Contractures never formed. Her speech was always slow, labored and indistinct.

Tonic neck reflexes acting on the arms and neck righting reflexes acting on the trunk and on the lower extremities were first noted when she was 5 years old. (No attempt to demonstrate them was recorded before that time.) When the face was turned to the right, her right arm became extended at the elbow and her left flexed, and both the legs and the pelvis swung to the left in the position assumed by young babies when rolling from back to front. When the position of her head was reversed, the position of her arms was reversed, but

Fig. 26 (case 15).—Encephalograms showing moderate increase in the size of the ventricular system with a small cranial vault.

her legs and pelvis did not swing beyond the midline. By voluntary resistance to the examination she could suppress the postural responses almost entirely, but unless it was resisted the imposed posture was maintained as long as the position of the head was maintained.

Encephalograms showed moderate enlargement of the third and lateral ventricles, slightly excessive collections of air over the frontal poles of the hemispheres, a small cranial vault and no evidence of a localized lesion.

Her family, being unwilling to accept institutional care, kept her at home as a helpless cripple.

A child who after postnatal symptoms of severe cerebral damage failed to acquire normal motor activity was given intensive physical therapy because of her social responsiveness. The objective evidence of cerebral palsy were hypotonia, athetosis and tonic neck reflexes acting on her arms. She learned to use a limited vocabulary and to stand unsupported for a few seconds. Convulsions first appearing at about the age of 5 years were followed by motor and mental deterioration. Encephalograms showed moderate loss in the bulk of the brain, without evidence of localized damage.

CASE 16.—A boy born May 2, 1929, was brought to the Children's Hospital at the age of 11 months because of failure to sit up. He was the only child of healthy parents and was born at full term by spontaneous cephalic delivery, but with a short cord wound tightly around his neck. His respirations were established with difficulty. He could not suck or swallow for several days and had several generalized convulsions on the second and third days fo life. After the fifth day he improved rapidly and did well from the nutritional point of view.

At the age of 3 months he seemed to recognize and to respond to his parents, and at the age of 11 months he was attempting to copy words and was pleased by songs to which he had become accustomed. He could not, however, hold his head up, sit up, take any weight on his feet or grasp objects successfully.

Physical examination at that time showed him to be a most responsive baby, with marked involuntary athetoid movements of his arms. There was a little weakness of the right side of his face; his tendon reflexes were everywhere lively,

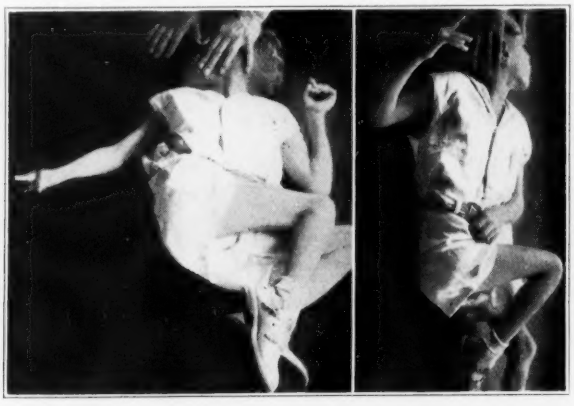

Fig. 27 (case 16).—Tonic neck reflexes affecting the arms and the left leg at the age of 7 years. The right leg is immobilized at the hip by various contractures.

and there were positive Babinski phenomena on both sides and sustained clonus at the right ankle. When he was held upright, his head flopped about into positions largely imposed by gravity, and his legs became crossed. Psychologic examination (Dr. E. Lord) showed normal interest and effort but performance far below normal. No note about the presence or absence of tonic neck reflexes was made at that time.

He was given physical therapy over a short period, and then, because his family moved to a different city, he was not seen until he was 7½ years of age. In the meantime, he had learned to sit up in a chair and to support his head; he could put food into his mouth with his left hand, but not with his right; he could not stand for a moment unsupported. His right hand and arm were the seat of a continuous coarse tremor, which disappeared during sleep and which completely prevented useful function. His speech was fluent and readily comprehensible. Physiologic examination (Dr. Lord) showed an adequacy sufficient to make a trial period of teaching advisable. This is at present being carried out and seems to show that the child can learn the essentials of first grade work slowly, but it is the opinion of his teacher that he will not be able to progress through more than the first few grades.

Neurologic examination at the age of 7½ years gave essentially the findings noted at the age of 11 months. Various contractures had formed about the hips and at the ankles. Tonic neck reflexes acting on the right arm, on the left arm and on the leg were readily demonstrable. The patient was cooperative and said that he could not control the positions imposed by the tonic neck reflexes. His right leg was so thoroughly immobilized by contractures that it did not respond to the tonic changes set up by the neck reflexes.

A child who immediately after birth, showed marked evidence of a severe cerebral insult, presumably anoxemic, had later a motor deficit exhibiting the characteristics of pyramidal and extrapyramidal cerebral palsy. In regard to intellect and personality he showed unusually slight impairment. Tonic neck reflexes acting on the extremities were demonstrated at the age of 7½ years, and their significance as an index of widespread cerebral damage was confirmed by his crippling motor disability and by the recognition on the part of an enthusiastic teacher of marked limitations in his capacity for education. His intellectual achievements, however, have gone beyond those of any other child observed in this clinic who had a fixed lesion of the nervous system persisting from infancy and tonic neck reflexes acting on the extremities.

Case 17.—A girl born Feb. 4, 1927, was admitted to the Children's Hospital at the age of 15 months because of failure to sit up. She was the only child of healthy parents. She was born at full term by a difficult left occipitoposterior delivery. Her mother was anesthetized twice, and a forceps was applied each time to the baby without the accomplishment of delivery, which was finally spontaneous. The umbilical cord was twisted twice about the baby's neck. She was extremely cyanotic at birth, and her respirations were established with great difficulty. Two tanks of oxygen were administered during the first two days of life, and for ten days the family were told she could not possibly live. She never learned to suck and always had trouble in swallowing.

Her development was slow. She recognized her family at the age of 6 or 8 months. At the age of 15 months she was interested in what went on about her but could not hold her head up or use her hands to grasp or play with objects because of the coarse involuntary movements which appeared whenever she attempted voluntary movements.

Physical examination showed a baby lying on her back with her arms externally rotated, abducted at the shoulder and flexed and supinated at the elbow, so symmetrically as to suggest a transection of the cervical portion of the spinal cord. On observation it was obvious that all active movements at the shoulder and at the elbow were present in normal range. They were, however, not under voluntary control. The tendon reflexes in the arms and in the legs were normal and equal, and the plantar reflexes were equivocal, causing sometimes upturning and sometimes downturning of the great toe. There was no clonus. She drooled continually and had great difficulty in swallowing.

Her family moved away and she was not seen, except during a few visits for physical therapy, until she was 4½ years old. At that time she had not improved at all in motor ability. The symmetrical rest position of the arms had disappeared, but voluntary effort to use the arms still engendered a variety of coarse involuntary

movements. Her tendon reflexes were normal, as were her plantar and abdominal reflexes. Tonic neck reflexes acting on all four extremities, with extension on the side toward which the chin was turned and flexion on the opposite side, were reliably elicited; the resulting postures of the extremities were maintained as long as the position of the head imposing them was maintained.

Psychologically she had advanced until she could pick out a named color from a series, could attend with interest to stories suited to children about 4 years of age and could appreciate much of what went on about her. The profound motor defect made it impossible to examine her satisfactorily, but it was obvious that her psychologic functions were in many respects far more adequate than her motor abilities, though in no respect normal for her age.

A concerted attempt to teach her useful motor patterns by training the muscles over a period of months produced no improvement: She never learned to stand

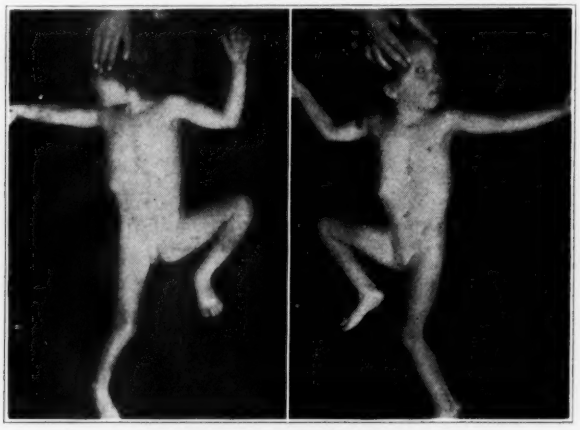

Fig. 28 (case 17).—Tonic neck reflexes acting on the extremities.

alone for even a moment, and she could not use her hands to feed or otherwise care for herself. At the age of 6 years she was unchanged, and her parents placed her in an institution.

A child with a history of a violent delivery and subsequent symptoms suggesting severe intracranial damage showed an inadequate motor development together with a degree of responsiveness which in her early years seemed to indicate normal intelligence. The presence of tonic neck reflexes suggested a diffuse severe cerebral lesion, a suggestion confirmed by her subsequent failure to profit from attempts at either motor or intellectual education.

The three remaining cases are presented as a group, since they illustrate rather special points in regard to the occurrence of tonic neck reflexes.

Case 18.—A girl born July 17, 1934, was admitted to the Children's Hospital at the age of 18 months because of frequently recurring convulsions.

The family history stated that her father and mother were living and well, that a paternal stepbrother and paternal uncle had fits, and that a paternal cousin had a mental illness of unknown nature. There were no other children.

The patient was born one month before term, after an uneventful pregnancy. She was small and weak and was not weighed at birth. She was kept in a hospital for one month because of prematurity; her nutrition, which had been poor at first, improved rapidly toward the end of this period. Her weight was considered satisfactory at the end of the first year.

Her development was extremely slow. At the age of 18 months she did not distinguish between her parents and strangers, though she made indifferently successful attempts to reach for bright objects. She learned to sit alone a few days before admission.

At the age of 6 months she had bilateral purulent otitis media, and a month later, she had a rash of unknown type.

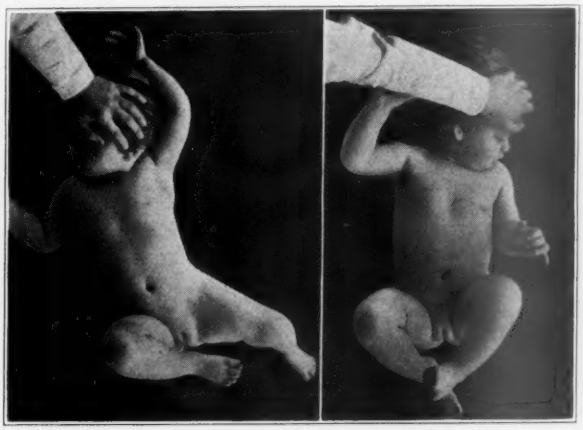

Fig. 29 (case 18).—Tonic neck reflexes about half an hour after a convulsion. Age, 21 months.

Ten days prior to her admission an acute infection of the respiratory tract developed, and during the two days prior to admission she had several generalized convulsions. Physical examination showed acute laryngitis, tonsillitis and bronchopneumonia. Laboratory studies of the blood, of the urine and of the spinal fluid showed nothing remarkable except leukocytosis. After recovery from the acute infection she appeared intellectually dull, paying no attention to anything.

At the age of 21 months she was readmitted because of continued convulsions occurring at intervals of a few days. Examination showed a dull child, who noticed objects, turned toward sudden sounds and could stand alone if placed on her feet. Save for irregular nystagmoid movements of her eyes, detailed neurologic examination gave no additional findings.

While in the ward she had three generalized convulsions, and for an hour or so after each of these, tonic neck reflexes acting on the arms could be demonstrated. The arm on the side toward which the chin was rotated became internally rotated and abducted at the shoulder and extended at the elbow, while the opposite arm became externally rotated at the shoulder and more or less flexed at the elbow. As the postconvulsive state passed off, the tonic neck reflexes became irregular and diappeared.

Because of a flare-up of the infection of the respiratory tract an encephalogram was not made, and the child was sent home.

At the age of 2½ years she was readmitted because of continued convulsions and failure to improve in ability. She could pull herself to a standing position but could not stand alone, and she did not attempt speech. No further convulsions were observed, and no tonic neck reflexes were demonstrated. Encephalograms showed marked enlargement of the ventricular system and a rather small head.

A baby with an unusual family history of convulsions was born prematurely and had in the neonatal period symptoms suggesting a cerebral injury. During her early months she suffered from a number of acute infections, and at the age of 18 months, after displaying an already unsatisfactory rate of development, she began to have convulsions during the course of an infection. Examination showed an obviously idiotic baby with nystagmoid movements of her eyes. Immediately after convulsions she had tonic neck reflexes for a short

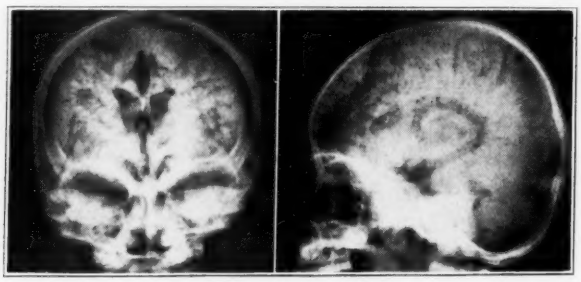

Fig. 30 (case 18).—Encephalograms showing enlargement of the ventricles and of the subarachnoid spaces in a small cranial vault.

period; but at other times they were not demonstrable. Her development continued to be unsatisfactory, and at the age of 2½ years encephalograms showed an extensive diffuse deficit in brain tissue.

Case 19.—A boy born Jan. 4, 1930, was admitted to the Children's Hospital at the age of 6½ years because of loss of mental and motor function which had progressed for eight months.

His family history and past history were in no way remarkable, and he was at first a rather better than average pupil in school. He had measles, chickenpox and whooping cough when between 3 and 4 years of age and cervical adenitis with abscess formation at the age of 4½ years. He had been successfully vaccinated and had been immunized to diphtheria in infancy.

When 6 years of age he had an acute illness, possibly scarlet fever; on his return to school his teacher noted that he was entirely unable to do the school work. During the ensuing three months progressive failure of memory, stiffness of his extremities and slow monotonous speech appeared. In May, four months after the onset, his spinal fluid showed 21 leukocytes and 72.8 mg. of protein per hundred cubic centimeters. He was given several doses of typhoid vaccine intravenously, which produced satisfactory hyperthermia but no clinical improvement. A month later he had otitis media on the left side, which cleared up satisfactorily

after myringotomy. At about this time he stopped speaking and did not get out of bed any more. Six months after the onset he became unable to swallow solid food, and eight months after the onset he had to be fed entirely by tube.

Physical examination at this time showed a child lying rigidly in bed, paying no attention to lights but making smacking sounds when the nurse brought his tray of food and set it on his table. There was extreme increase in the tone of the extensor muscles of the legs and trunk and in the tone of the flexor muscles of the elbows, wrists and fingers. His tendon reflexes were everywhere increased, clonus was readily demonstrable at both ankles, and Babinski's phenomenon was bilaterally present. His pupils reacted to light, and his optic fundi were normal; but he showed no evidence of vision. So far as could be ascertained, the remaining cranial nerves were normal. Roentgenograms of the skull and studies of the blood and of the spinal fluid all gave normal findings.

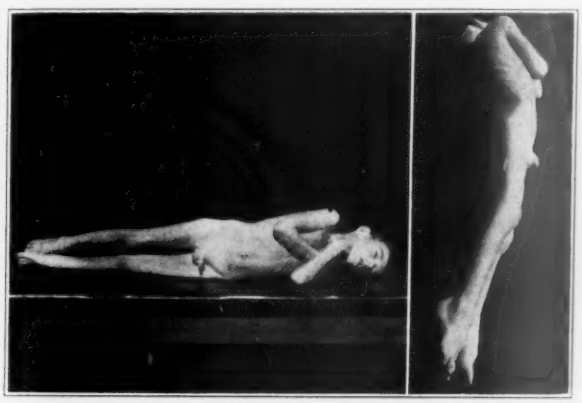

Fig. 31 (case 19).—Extreme decerebrate rigidity nine months after the onset. At this time no tonic neck reflexes could be demonstrated.

During the ninth month of his illness his temperature became unstable; swings up to 104 F. were followed by drenching sweats so severe as to fill the concha of whichever ear was uppermost with a pool of sweat. Blebs which dried into black eschars formed on his toes and peeled off, leaving apparently normal skin beneath them. At this time he had periods of groaning and crying out as if in great distress; these were controlled by liberal doses of barbiturates.

Throughout this month decerebrate rigidity was extreme, but attempts to demonstrate tonic neck reflexes acting on the extremities were uniformly unsuccessful. During the eleventh month of his illness the rigidity became less marked; it was no longer necessary to protect the palms of his hands against damage by the nails of his tightly clenched fingers, and his hands habitually lay on the lower part of his chest instead of being pressed against his chin. During the latter part of this month, tonic neck reflexes acting on his arms could be demonstrated. They appeared after latent periods of five to ten seconds, and the processes of extension and flexion at the elbows occurred only very slowly. The positions of the extremities were maintained as long as the inducing position of the head was maintained. No difference in the position of his stiffly extended legs was ever detected. The reflexes were reliably demonstrable over a period of several weeks and then, in spite of apparently progressive disease, disappeared again.

The best evidence that his disease continued to progress was afforded by encephalograms taken one year after the onset. These showed extensive atrophy of the cerebral hemispheres, which had only a skeleton of their former structure. Moreover, examination of several partitions of the fluid removed at encephalography showed that the total amount of protein in the portion withdrawn last, and

Fig. 32 (case 19).—Tonic neck reflexes affecting the posture of the arms eleven months after the onset of illness.

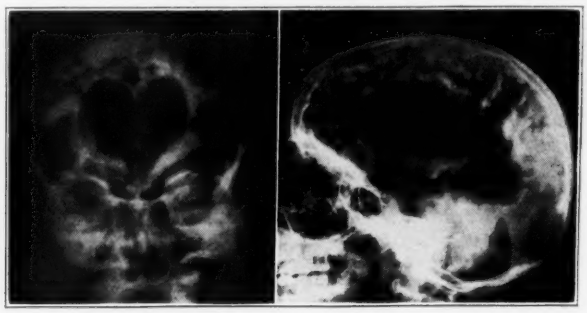

Fig. 33 (case 19).—Encephalograms taken twelve months after the onset showing practically complete destruction of the cerebral hemispheres.

presumably intracranial in origin, was 130 mg. per hundred cubic centimeters as compared with 64.2 mg. in the first portion. It was assumed that this increase in protein was the result of still active inflammation or disintegration of the brain, since no blood was encountered in it. In addition, the patient had by this time ceased to react in any way to the advent of his feeding tray.

A child with a remorselessly progressive destructive cerebral process was admitted to the hospital in a state of extreme decerebrate rigidity, but without demonstrable tonic neck reflexes. When during the course of his illness his rigidity diminished, tonic neck reflexes became reliably demonstrable, only to disappear again as his rigidity became even less marked, though his disease was apparently progressing.

CASE 20.—A boy born June 3, 1936, was admitted to the Children's Hospital at the age of 6 months because of difficulty in feeding and constant crying. The family history was not remarkable. His mother had vaginal bleeding at intervals during the fifth month, but otherwise the pregnancy was not eventful. The patient was born normally at term, weighed 5 pounds (2,268 Gm.) at birth and seemed normal during the neonatal period.

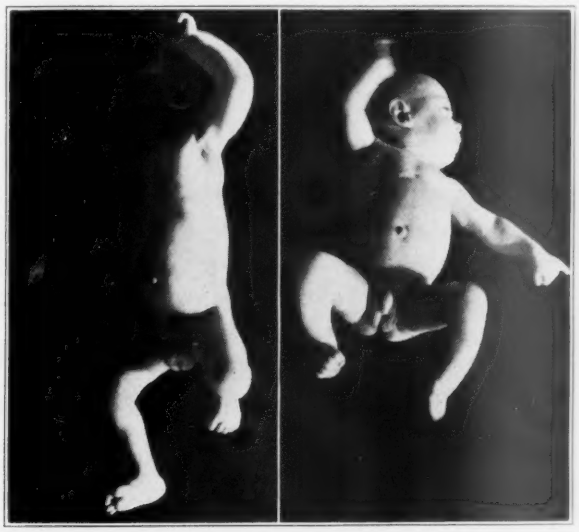

Fig. 34 (case 20).—Tonic neck reflexes affecting the arms and the right leg.

Within a few weeks after birth a mucoid nasal discharge developed, and the baby experienced difficulty in feeding. He was given a variety of feedings but showed no improvement. When about 2 months of age he began to cry a great deal of the time and was not appeased by food or comforting. When 4 months of age he had attacks during which he became stiff, apneic and cyanotic. His mother noted no twitching during the attacks.

Examination showed a fairly well nourished, restless baby with retracted head and a rather full anterior fontanel. He did not reach for or grasp objects, and he was not seen to play with his hands or feet in the manner usual for his age. He did, however, turn his head toward light and sound. His muscle tone was most variable; at times he seemed in general rather stiff and at other times rather limp. His tendon reflexes were everywhere active and equal; his plantar reflexes were doubtful, and clonus could not be elicited. The motor cranial nerves appeared normal, and his fundi were not remarkable.

Well marked tonic neck reflexes acting on all four extremities were readily demonstrable, with extension on the chin side and flexion on the occipital side. The imposed posture of the extremities was maintained as long as the imposing position of the head was maintained, or until the baby's struggles against the examination became intense.

After his admission he had several convulsions, some of which were reported to be on the right side and others on the left. On investigation it was found that the obvious clonic movements of the attacks could be modified by turning the head and that the extensor response on the chin side was sufficiently strong to suppress them, while on the occipital side they were obvious. The baby continued to have convulsions, rapidly became more ill and was discharged at the parents' request the day after his admission, before complete data could be obtained. Wassermann tests of the spinal fluid and of the blood were negative.

He died at home two days after his discharge; permission for autopsy was not obtained.

A baby with a history suggesting progressive cerebral disease was admitted to the hospital at the age of 6 months. By far the most outstanding sign on examination of the nervous system was the finding of tonic neck reflexes acting on the extremities. While in the hospital he had convulsive attacks, the pattern of which could be modified by the position of the head in relation to the body. He was discharged before he had been thoroughly studied and died under his parent's care two days later.

COMMENT

Recognition of Tonic Neck Reflexes Acting on the Extremities.—The clinician is unfortunately not in quite as certain a position as the experimental physiologist with regard to the recognition of tonic neck reflexes acting on the extremities, for the physiologist can completely do away with the uncertainties introduced by voluntary movement on the part of his subjects. But in certain instances voluntary movement in children is so nearly abolished, either by the cerebral lesion or by the reflexes themselves, that when the head is turned either actively or passively to bring the chin over one or the other shoulder, obvious and constant postural changes of extension on the chin side and flexion on the occipital side occur and are maintained as long as the inducing position of the head is maintained. In such instances the reaction is striking and readily recognized, the patient assuming what might be termed the fencer's position.

The fundamental of the reflex is not, however, postural change in the extremities; it is change in the distribution of tone in the extensor and, to a less extent, in the flexor muscles of the extremities (Beritoff, Magnus, Walshe). If voluntary efforts are sufficiently powerful, movement is possible in spite of the changes in tone. Thus restless or resistant children can often suppress the typical pattern of the Magnus reflex if they struggle against the examination. Such struggling is

often induced by suddenly imposed passive rotation of the head, which stimulates the labyrinths and causes a variety of phasic reflexes. Active rotation of the head by the baby itself, in response to visual or auditory stimuli or in sucking from a bottle given from the side, is often a much better way of demonstrating the tonic reflexes than passive rotation. In cases of extremely defective or extremely young babies, resort to passive rotation of the head must, however, be made. If tonic reflexes are present in such a case and are suppressed by voluntary activity, changes in the extensor tone of the extremities can often be demonstrated by attempting passive movements in flexion and extension with the head turned first to one side and then to the other. Such changes in tone should, of course, be maintained as long as the inducing posture of the head is maintained, in order that one may prove the tonic nature of the reflex.

Significance of Tonic Neck Reflexes Acting on the Extremities in Man.—The occurrence in man of tonic reflexes of the sort under discussion, that is, those expressed by increase in extensor tone on the chin side and decrease on the occipital side, is an expression of the release of a phylogenetically and ontogenetically archaic motor mechanism from control by the newer superimposed mechanisms ordinarily present in the forebrain. The evidence that this is so is threefold.

The experimental evidence obtained in the physiologic laboratory has been reviewed. It shows that the reflex is regularly present in intact quadrupeds low in the phylogenetic scale and is less and less obvious in those higher in the scale, until in adult apes it is rarely demonstrable and in adult man never. In the higher experimental animals decerebration regularly allows the full expression of this hitherto latent principal motor mechanism.

In the second place, human fetuses have been shown by Minkowski to exhibit modified postural changes controlled by the position of the head in relation to the body. Under proper conditions many, if not all, babies up to about the age of 3 months show classic tonic neck reflexes, and fragments of the pattern are seen if one watches their spontaneous postures.

Third, the evidence presented here shows by various methods that the higher portions of the nervous system in older infants and children exhibiting the reflex were severely damaged. Encephalograms in cases 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 15 and 19 showed extensive loss in the bulk of the cerebral hemispheres. Unsatisfactory development, sufficiently obvious to convince both the doctors and the families of the patients of extreme deficit, was present in cases 5, 10, 13, 14 and 17. In case 9 autopsy showed a greatly dilated ventricular system with pressure atrophy of the cerebral hemispheres. An exact diagnosis

was never made in case 20, but the downward course, marked by difficulty in feeding and convulsions and ending in death, suggests a progressive cerebral disease.

That tonic neck reflexes acting on the extremities are an expression of a fundamental mechanism of the nervous system is further suggested by the fact that they are seen as the result of extensive lesions of the nervous system, either destructive or developmental in origin. The evidence contained in the histories of cases 1 to 9 inclusive and 14 to 17 inclusive suggests, with more or less emphasis, injury or disease operating in the natal or neonatal period or in the first few months of life on a nervous system presumably normal in development. The evidence that the cerebral lesion was developmental in cases 10, 11, 12 and 13 is, though far from absolute, nevertheless fairly good.

That the occurrence of tonic neck reflexes is an expression of loss of function of the higher centers of the brain is also suggested by the course of events in case 18, in which tonic neck reflexes appeared while the patient was in a semistuporous condition immediately after a convulsion but were not seen at other times. Theoretically, it would seem that during periods of stupor following convulsions tonic neck reflexes might be demonstrable in the presence of an anatomically intact nervous system. Other reversible conditions accompanied by loss of function of the higher portion of the nervous system might similarly be associated with tonic neck reflexes temporarily.

It should be noted that many children hopelessly crippled in motor activity are seen who do not show tonic neck reflexes. As an illustration of this point, the history of case 19 is instructive. At the time of the patient's admission to the hospital, in spite of classically distributed decerebrate rigidity of extreme grade, no tonic neck reflexes were found. As his disease progressed, as evidenced by his loss of response to a certain set of sounds, his rigidity became less intense, and tonic neck reflexes acting on his arms appeared. Subsequently, though the rigidity became even less marked, with a presumably progressive process still active in the nervous system, the reflexes again disappeared. The exact explanation of this course of events is not clear, but the history suggests that damage of a certain degree or of particular distribution in the nervous system is necessary for the emergence of the reflexes and that damage of lesser or greater degree or of different distribution does not allow them to appear.

SUMMARY

When children over 5 or 6 months of age have fixed or progressive lesions of the nervous system, tonic neck reflexes acting on the extremities are of serious prognostic significance, as they indicate a severe grade of diffuse damage to the higher portions of the nervous system, particularly to the motor portions. My impression is that they indicate

a basic physiologic equipment so inadequate that no form of physical therapy yet devised has any real effect on the patients' disabilities. The difficulty is in part purely motor, and I assume that the disability is the result of inadequate voluntary control as well as of disturbance to the more primitive postural mechanisms. Of the three older children crippled from birth, none has learned to walk, and only one has learned to stand for a few moments unsupported. Lord [17] showed how unlikely it is that muscular training will enable children to walk who are crippled by cerebral palsy and who had never taken steps alone by the time they were 6 years old. None of the younger children of the group given training has acquired sufficient voluntary control to give hope of his walking.

Mental deficiency accompanying the motor disturbance plays a large part in the failure of physical therapy and is the result of the diffuse type of injury of the forebrain from which these children suffer. Theoretically, the almost complete motor decerebration which appears to be the essential mechanism in the releasing of tonic neck reflexes could occur without such diffuse damage, but in the cases presented here discrete and sharply localized injury is the exception. It may be that the study of adult patients will lead to different conclusions.

The mental defect ranges from a state of almost complete abolition of mental function (case 5) to a level at which a child now 7½ years of age can do the equivalent of first grade work under individual instruction, although his teacher, enthusiastic as she is, does not expect him to be able to go beyond the first few grades. This child (case 16) has been repeatedly tested and has always shown more ability than any of the other members of the group under review. Lord [17] showed how unreliable intelligence quotients are when applied to children crippled with cerebral palsies. Because of this unreliability I have not used intelligent quotients in this study but have depended on the results obtained by attempts at actual teaching.

In the study of children the observer is constantly forced to cope with the complex fact that patterns change as growth advances. Prognosis involves not only a consideration of recovery to a previously attained level, but, as Crothers and Lord [18] have pointed out, an attempt to understand the effect of a lesion on growth and development. In infants the demonstration of tonic neck reflexes was repeatedly the one objective sign obtainable on physical examination pointing to an injured or defective nervous system. Several infants in the group were rather small and so responsive socially that they might well have been classed under the vague term bright unless careful scrutiny of their abilities in compari-

17. Lord, E. E.: Children Handicapped by Cerebral Palsy, Commonwealth Fund, London, Oxford University Press, 1937.

18. Crothers, B., and Lord, E. E.: Tr. Am. Neurol. A. **60**:67, 1934.

son with their ages had been made—and their very responsiveness would in a busy ward have tended to postpone such a comparison indefinitely.

CONCLUSIONS

Twenty cases of cerebral palsy are reported in which tonic neck reflexes acting on the extremities were found. In children such reflexes, which produce extension on the side toward which the chin is directed and flexion on the side near the occiput, are evidence of such severe loss of cerebral function as to disorganize thoroughly both the principal motor mechanisms and voluntary movement. In cases of fixed or progressive lesions of the brain this loss of function is due to an actual loss of tissue, which is anatomically demonstrable and which involves the cerebral hemispheres diffusely. The sign is of value as evidence, often the most reliable clinical evidence, of extensive cerebral lesions in infants. It is of equal value in helping to identify older children who are not likely to respond to therapy or to progress under educational routine.

Dr. Bronson Crothers gave help and criticism in the preparation of this paper.

HYSTERICAL BLINDNESS IN CHILDREN

REPORT OF TWO CASES

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Hysterical amblyopia, according to Fuchs,[1] occurs for the most part in young persons, particularly in girls. The literature on this subject shows, however, that a large majority of case reports have concerned adults, and comparatively few, children.

In a number of instances in which the hysterical type of amblyopia was said to have been present in a child, the diagnosis was open to question. When the condition is unilateral, amblyopia ex anopsia and congenital amblyopia must be ruled out carefully before a definite diagnosis of the hysterical type can be made. De Schweinitz [2] recorded a case of unilateral hysterical amblyopia in a child of 11, observed one in a child of 14, and cited one seen in a child of 11 by Pitres. When amblyopia is bilateral, as is more frequently the case, one is on firmer ground. Bilateral hysterical amblyopia in children was observed by Burch,[3] Pereira and others, but in the aggregate the number of proved cases is still small. In this paper two such cases are added to those already reported.

Whether in adults or in children, the conditions underlying hysterical amblyopia are similar. Parinaud [4] stated that the blindness had been noted as a transitory manifestation connected with hysteria. In hysterical persons certain ideas become disassociated from the remainder of the personality.[5] The disassociation is based on extreme psycho-

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1. Fuchs, E.: Text-Book of Ophthalmology, ed. 8, translated by A. Duane, Philadelphia, J. B. Lippincott Company, 1924, p. 236.

2. de Schweinitz, G. E.: The Eye and Nervous System, New York, J. B. Lippincott Company, 1906, p. 617.

3. Burch, F. E.: Am. J. Ophth. **8**:699, 1925.

4. Parinaud, M.: Ann. d'ocul. **124**:17, 1900.

5. Janet, P.: The Major Symptoms of Hysteria, ed. 2, New York, The Macmillan Company, 1920.

logic tension which, because of apparently insurmountable difficulties, leads the subconscious mind to accept one of two alternatives: fight or flight. Burch [3] emphasized the presence of an intolerable situation in a diagnosis of hysterical amblyopia.

The amblyopia may be transitory, lasting but a few hours to several days; it may persist a few weeks, or it may continue many months or years.[2] The precipitating cause may be a slight injury, fright or excitement, or the condition may occur without apparent reason. It may arise suddenly or come on gradually, deepening with advancing days and weeks.

The diagnosis can be made only in the assured absence of organic disease of the ocular or nervous system. The question of malingering, particularly in the unilateral type, has not infrequently been brought up, because tests for malingering appear to indicate that the patient sees with the hysterically amblyopic eye.[6] Jackson,[7] however, observed that although hysterical amblyopia and malingering have been thought of as being closely allied, actually "they are separated by the wide gap that lies between consciousness and unconsciousness. The malingerer is conscious that he can see, the hysterical is not."

Binet and Janet [8] showed that if some object is held before a hysterically amaurotic eye and the patient is then hypnotized, he can tell what the object was. As Prince [9] stated, "The hysterical blind see, but their visual sensations are not in connection with their dominating waking consciousness. There would seem to be a shutting off from the field of consciousness of certain perceptions which form a group of separate sensations, and which, by artificial means—for example the hypnotic state—would as memories be brought into relation with the remainder of the conscious field."

The essentially characteristic finding in hysterical amblyopia is the tubular vision field. Its form limits may vary from moderate contraction to constriction extreme enough to be immediately around the point of fixation. The size of the field remains approximately the same regardless of the distance of the point of fixation from the eye. Veasy, in a discussion of a paper by Cordes and Horner,[10] compared this phenomenon to the hysterical deafness in which an approaching

6. Parinaud, M., in Norris, W. F., and Oliver, C. A.: System of Diseases of the Eye, Philadelphia, J. B. Lippincott Company, 1897-1898, p. 727.

7. Jackson, E.: Am. J. Ophth. **4**:629, 1921.

8. Binet and Janet: Arch de neurol. **24**:29, 1892.

9. Prince, M.: J. Abnorm. Psychol. **3**:32, 1908.

10. Cordes, C. C., and Horner, W. D.: Tr. Pacific Coast Oto-Ophth. Soc., 1932, p. 92.

noise, no matter what the intensity, is heard at the same distance from the ear and in which the duration of audition of a tuning fork remains unchanged no matter how hard it is struck. Greef [11] explained the tubular field on the basis that a definite conception dominates the sensorium and consequently extends to the visual field. Even with extreme contraction of the field, patients with hysterical amblyopia apparently are not handicapped by lack of peripheral vision. They move about without hesitation and appear well oriented. Wilbrand [12] explained this fact by assuming that the irritability of the retinal periphery is not lost and that this irritability is greater when the person moves about. He also described another form of hysterical field, "the oscillating field," in which the object disappears and reappears several times in the same meridian. This symptom is ascribed to rapid change in retinal sensitivity.

The field for colors is usually contracted inside the hysterically shrunken form field, with the colors appearing in their normal physiologic order. Since the red field is last to be affected, its extent may be equal to or greater than that of blue, and there may even be color interlacing.

Von Graefe regarded hysterical amblyopia as a disorder due to involvement of the outer layers of the retina, which causes an interruption of their connection with the nerve fibers. Wilbrand [12] ascribed it to certain alterations in the visual substance of the rods and cones. Binswanger [13] said it is due to corticosensory fatigue. Janet,[5] Charcot [14] and Leber [15] likewise considered hysterical amblyopia not as a disturbance in retinal function but as a cerebral phenomenon. Berheim [16] stated the belief that visual impressions are obtained normally in the retina but are unconsciously suppressed. The blindness is due not to failure of the retina to appreciate images of external objects but to a functional disturbance of the cortical centers. If a patient has unilateral hysterical amaurosis, a prism placed before the nonseeing eye, as in a test for malingering, will elicit diplopia. This indicates that the blind eye has been associated with the other eye in the act of binocular fixation, although the explanation is not satisfactory. Parinaud [6] stated that only central vision takes part, the peripheral portion of the visual field remaining abolished.

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11. Greef, cited by de Schweinitz.[2]
12. Wilbrand: Arch. f. Augenh. **12**:277, 1893.
13. Binswanger, L.: J. f. Psychol. u. Neurol. **11**:65, 1908.
14. Charcot, J.: Leçons sur les maladies du système nerveux, Paris, V. Adrien Delahaye & Co., 1875.
15. Leber: Arch. f. Ophth. (pt. 3) **15**:26, 1869.
16. Berheim, cited by de Schweinitz.[2]

REPORT OF CASES

CASE 1.—*History.*—Mary R., a 12 year old girl suspected of having a tumor of the brain, was admitted to Mount Zion Hospital on Sept. 4, 1935. Her present complaint was a progressive diminution of vision, which had begun five months earlier and had failed to improve on treatment in the outpatient department. The amblyopia had gradually increased. Occasionally the patient had had photophobia, diplopia and blurred vision and had seen colored spots before her eyes. She claimed to be able to distinguish form fairly well but to be unable to read ordinary-sized print. She also had commented frequently on a dull or burning pain "in her eyes." On two occasions during the five months she had had projectile vomiting without apparent cause.

The patient's parents, who were of Central American stock, were living and well, as were her four brothers and five sisters. There was no familial disease, but the living conditions were poor. Since the parents did not speak English well, the patient and her 14 year old brother had to supply the history.

About two months previously, while Mary was crossing the street with one of her brothers, she suddenly became blind and dizzy. The brother led her about, and after a few minutes her vision was gradually restored. A few minutes later, however, the same sequence of events was repeated.

When one went further back into the history, it was found that Mary had always been a very sensitive, shy girl, who made only average progress in school. Psychotic episodes for at least three years were reported. She had heard the voice of her father (he was alive) commanding her to "go to the kitchen" in order to perform duties which even at the time of the hallucination she realized were unnecessary. Moreover, after the death of an uncle two years previously, she claimed to have awakened on at least three occasions to find him standing silently at her bed.

About six months before the onset of her difficulty, Mary's close chum, a 13 year old girl of Mexican descent, suffered similarly from defective vision. She was unable to read or to see the blackboard and was relieved from classroom recitation, given special work to do for over two weeks, and sent to the clinic to receive glasses, after which she became all right again. Mary stated in a pleased way that her troubles were precisely the same as her friend's had been.

Examination.—The patient was pale and thin and rather small for her age. The only pathologic organic findings were as follows: Externally both eyes were entirely normal. Visual acuity in each eye was barely 20/70. The pupils reacted normally to light and in convergence. Corneal reflexes were present but noticeably diminished. Refraction with the eyes under atropine cycloplegia revealed an error in each eye requiring a plus 0.25 D. sph. combined with a plus 0.25 D. cyl., axis 90. This correction had no effect on the visual acuity. Ocular movements well full in all directions, but on looking to the extreme right or left there were coarse nystagmoid jerkings. Ophthalmoscopically the media were clear and the backgrounds entirely normal. Ishihara charts revealed red-green color blindness. The perimetric field in each eye showed shrinkage of the form field to the 10 degree circle. In spite of these tubular fields, the patient had no difficulty whatever in her movements, going about freely.

There was a positive reaction to a tuberculin test. The blood and the urine, however, were normal, and roentgen examination of the skull, the chest and the sinuses failed to reveal any pathologic condition. The spinal fluid was normal on chemical and microscopic examination.

Results of a mental test given sixteen days after the child's admission to the hospital showed the patient to have high grade feeblemindedness (chronologic age, 12 years; mental age, 8 years and 8 months; intelligence quotient, 72, and range, 7 to 10). Her muscular coordination and form and space perception were dull but superior to her level of intelligence. She had a special interest in drawing and a facility far superior to the unsteadiness of coordination found in her general handwriting.

Progress.—One week after her admission it was observed that the patient's mental attitude was already much changed. The child not only had been without complaint since the spinal puncture but actually said she felt better. Whereas previously she had been reticent, shy and noncooperative, she was definitely sociable, cheerful and cooperative. When her vision was tested informally and without her becoming aware of examination, she was able to read both small and large print well at either the normal or more than the usual distance. On complete reexamination of the eyes two weeks after entry, normal vision was found restored, and there was no defect of the fields or of color perception.

On Sept. 24, 1935, or approximately three weeks after admission, the patient was dismissed to the Stanford Convalescent Home for two months, after which she returned to her family. Because of the language barrier the situation was explained to her parents without much success. Nevertheless, the child's vision remained normal, and there was no repetition of hallucinations. She was last seen October 1936 and seemed in good spirits.

The only therapy involved in this case was change of environment. First, there were the few weeks of friendliness and concentrated personal attention in the hospital. Coupled with this was continued separation from the chum who had similar ocular trouble.

CASE 2.—*History.*—Constance G., 8½ years of age, was seen in September 1935. Her mother stated that for a number of weeks the patient had been experiencing an increasing difficulty in her lessons at school and at home. She was holding her books very close to the eyes and was unable to read except slowly and haltingly. During the last few days this condition had become so much worse that words were becoming too blurred for the child to make out.

There were no significant physical or psychologic data and the developmental history was normal. The patient was the youngest child and the only girl in a doting family circle of middle-aged parents (56 and 46 years old, respectively) and four older brothers, 29, 22, 16 and 12 years of age. On further questioning regarding any episodes in the family life which might have upset the patient emotionally, the mother added that an older, favorite brother was about to be married. The patient's ocular troubles had begun shortly after the brother's engagement was revealed to her. The mother mentioned also that a classroom chum was having ocular difficulties, to which considerable attention had been called by the teacher.

Examination.—Physical examination revealed that all was essentially normal. Both eyes were externally normal, as were the pupillary reflexes. Corneal reflexes were almost abolished. Visual acuity of the right eye was 10/200 and of the left eye, 2/200. The media and the fundi were normal. Perimetric color fields were constricted to the 5 degree circle. The Wassermann and Kahn reactions, the blood and the urine were normal.

The child, an attractive and well dressed girl, appeared rather shy and tense at the beginning of the physical examination, but when she left the office her

behavior was changed. She seemed very much at ease and expressed her satisfaction that the doctor did not lie to her, that "he told her beforehand when he had to hurt her," and so on.

Outcome.—When the patient returned on the next day she seemed in excellent spirits. In the Binet-Simon test this 8½ year old girl performed on a 9 and 10 year level. She spoke voluminously about her engaged brother and her affection for him, based apparently on the many gifts he had given her. "I like Ray best of all my brothers. He gave me a suitcase on my last vacation. He is getting married a week from Saturady and going to live in Burlingame. He has bought this coat I wear today and given me Christmas presents. I like him to live with me all the time. I do not want him to marry. I would like to tell him not to be away from home so much."

Apparently her vision was restored to normal already. Her handwriting in the test was excellent. "My eyes are all right now," she said. "I can hold the paper far away. I can see what it says. My mother will give me a new dress for the wedding."

Three days later the girl was reexamined. Vision and the fields were normal. Two months afterward the school nurse reported that the patient's performance in school was giving no cause for complaint.

Restoration of vision in this case occurred even more dramatically than in that of Mary R. Vision was already improved when the child left after the physical examination, even before she had poured out her heart about her brother. The only instrument, seemingly, which brought about recovery was the friendly attention of the physician and the patient's feeling of rapport with him. No suggestive treatment was used and no direct reassurance given to the child. The mother, however, was told on the very first day that the condition probably was not serious but was due to an emotional upset on the part of the child.

COMMENT

The two cases here reported have several features in common. Among them are:

1. Emotional upset over the loss, either actual, as in the first case, or felt, as in the second case, of a beloved close relative. Mary's uncle died; Constance's brother was about to be married. In each instance was involved a loss of affection and attention.

2. Both children had witnessed the special interest given to a friend who had trouble with her eyes. It seems reasonable to assume that emotional stress prepared the ground and experience designated the organ of functional disturbance.

3. The dynamics of recovery were similar in the two cases. Friendliness and a feeling of confidence were inherent in each. For Mary, a two week stay in the hospital with complete change of environment was required; recovery was gradual. For Constance, recovery was almost miraculous, occurring actually in the course of an office visit.

Her prompt recovery was probably due to the more superficial nature of the disturbance and to its shorter duration (two weeks vs. five months). Constance suffered only from the partial blindness; Mary had deep personality disturbances besides.

In conclusion, it must be emphasized that although suggestion apparently played a large part in patterning the symptoms of both children, no direct suggestion was used in treating them. Neither were any of the psychoanalytic technics employed. Nevertheless, it must be realized that understanding of the functional manifestations described depends on Freud's concept of hysteria as a physical expression of an emotional conflict.

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NUTRITIONAL HEART DISEASE IN CHILDREN

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Heart disease in children is not encountered as frequently in Charleston as it is in places with colder climates. In the past nine years there have been recorded only forty-three cases in a small but active pediatric service at Roper Hospital. Of these, in four cases the condition was classified as congenital, in twenty-five cases as rheumatic and in thirteen cases as nutritional. Hence, in this locality cardiac disturbances of nutritional origin are relatively important and by no means rare.

Much has been written about the heart in cases of beriberi and about the association of cardiac enlargement and failure with a deficiency of vitamin B_1. Some years ago I reported[1] several cases which I thought were instances of beriberi, and possibly the cases considered here are of the same nature, though it seems doubtful that the absence of only one vitamin can be blamed for the symptoms.

In the cases presented here the diagnosis of nutritional heart disease was made on the basis of the following conditions: cardiac enlargement, shown by percussion and by roentgen examination, without accompanying murmur; negative results of urinalyses; absence or sluggishness of reflexes; a history of deficient diet, and more or less rapid response to rest and sufficient food. Dietetic histories in most cases were vague, but malnutrition was generally evident. The level of the serum protein was not used as a criterion, since the findings in this series were not consistent.

The thirteen patients were children whose ages varied from 14 to 48 months and averaged 25 months. Only one was white. This contrasts with the figures for the twenty-five patients with rheumatic cardiac disease, whose ages ranged from 3 to 12 years and averaged 9 years. The latter group included only seven Negro children.

The cause of this cardiac enlargement does not appear in these cases. Whether deficiency of vitamin B_1, deficiency of protein or general dietetic deficiency is the fundamental cause is still a matter of some disagreement. The accumulated evidence appears to be conflicting.

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1. Waring, J. I.: Beriberi in Infants, Am. J. Dis. Child. **38**:52-56 (July) 1929.

General retardation of growth in infancy produces a heart and a thoracic cavity smaller than normal.[2] The heart is said to enlarge in scurvy[3] and possibly in rickets as well as in beriberi,[4] and in beriberi it is said to return quickly to normal size when vitamin B_1 is given.[5] In this series of cases the rapid reduction in size has not always been apparent. The increase in size is said to be due to edema of the cardiac muscle rather than to true hypertrophy, and the electrocardiogram is said to be normal, except as the conduction time is shortened.[6] In pellagra the heart is normal or subnormal in size and shows no electrocardiographic changes.[7] In deficiency of vitamin B_1 as manifested in the rat, there is a distinct bradycardia.[8] This phenomenon did not appear in the cases considered here. In all of them pulse rates were high, varying from 100 to 150 a minute, nor was there any remarkable change when the patients improved clinically.

In a few experiments performed recently with rats kept on diets deficient in vitamin B_1, no gross or histologic changes were noted in the hearts, nor was there any marked change in the total amount of serum protein.[9]

The cases of cardiac disease can be summarized briefly as follows:

REPORT OF CASES

CASE 1.—A Negro boy aged 18 months was admitted to the hospital in September 1934, with a history of fever and swelling of about four weeks' duration. The past history was unimportant, except that the child's diet had consisted almost

2. Bakwin, H., and Bakwin, R. M.: Body Build in Infants: Effect of Retarded Growth on Dimensions of Cardiac Silhouette and Thoraco-Abdominal Cavity, Am. J. Dis. Child. **49**:870-875 (April) 1935.

3. Wolbach, S. B.: Pathologic Changes Resulting from Vitamin Deficiency, J. A. M. A. **108**:7-13 (Jan. 2) 1937.

4. Abt, I. A.: Child's Heart in Avitaminosis, Am. J. Dis. Child. **50**:455-471 (Aug.) 1935.

5. Cowgill, G. R.: The Vitamin B Requirement of Man, New Haven, Conn., Yale University Press, 1935.

6. Wenkebach, K. F.: Das Beriberi Herz, Berlin, Julius Springer, 1934.

7. Porter, W. B., and Higginbothem, U.: Heart in Endemic Pellagra, South. M. J. **30**:1-4 (Jan.) 1937.

8. Birch, T. W., and Harris, L. J.: Bradycardia in Vitamin B_1 Deficient Rat and Its Use in Vitamin B_1 Determinations, Biochem. J. **28**:622-633, 1934.

9. These experiments were performed with the assistance of Dr. Roe E. Remington, Dr. Eleanor Townsend and Dr. Thomas Peery. Eight white rats were put on a basal diet for vitamin B_1 (vitamin-free casein, Osborne-Mendel salt mixture, yeast and green leaf kept in an autoclave for eight hours under 15 pounds of pressure). Four controls were fed on dog biscuit. The rats on the deficient diet showed loss of weight and the usual evidence of polyneuritis and of deficiency of vitamin B_1. The total amounts of serum protein ranged from 4.96 to 7 Gm. per hundred cubic centimeters, averaging 5.70 Gm. The total amounts for the controls ranged from 5.56 to 6.2 Gm., averaging 5.86 Gm.

entirely of cereals and soup for some months past. He weighed 22 pounds and 12 ounces (10,319 Gm.) and showed general edema, a large liver and a heart enlarged to right and left, with a soft apical systolic blow. The urine was normal on two examinations. A roentgenogram confirmed the presence of cardiac enlargement. On a diet high in protein, including brewers' yeast, iron and cod liver oil, the patient improved steadily, and he was discharged in fairly good condition after seven weeks.

A roentgenogram made in July 1936 showed the heart to be of normal size. When seen in October 1936 he was apparently in good condition, with the heart normal according to physical examination.

CASE 2.—A Negro boy aged 2½ years was admitted to the hospital in August 1931. He had previously had measles and pneumonia. He was breast fed for seven months and then was irregularly fed condensed milk and other foods, including cod liver oil occasionally. He had been swollen for two days and had been "stiffening out" for one day. His weight was 16 pounds (7,257 Gm.).

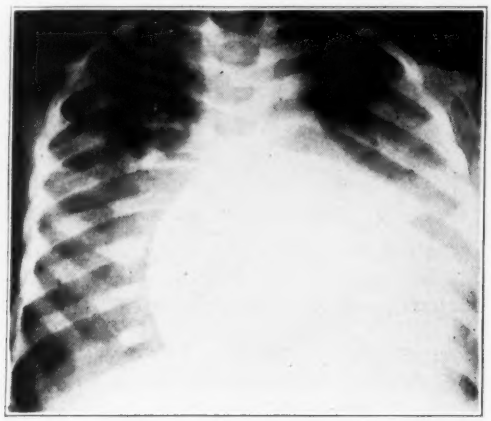

Fig. 1 (case 1).—Roentgenogram taken on admission.

He showed edema of the hands and feet, enlargement of the wrists and parietal bossing. His spleen was palpable; the knee jerk reflex was absent. At times he showed carpopedal spasm and Chvostek's sign. His heart was enlarged to percussion and yielded no murmur. A roentgenogram confirmed the presence of this enlargement and showed rachitic changes about the wrists and, incidentally, unerupted Hutchinson teeth. The urine was normal.

After three days on a full diet reenforced with brewers' yeast, viosterol and calcium lactate, he showed fairly active knee jerks and was able to stand. After some loss of weight, he gained 6 pounds (2,721 Gm.) during a stay of sixty days in the hospital. His cardiac enlargement persisted during this time.

In February 1932 he was readmitted to the hospital, with fever, cough and rales, having been edematous for a week. He showed the same cardiac enlargement and a large liver. The urine contained albumin, but it was normal on the following day. In two days his edema was no longer visible. On a diet including yeast and cod liver oil he lost 4 pounds (1,814 Gm.) before starting to gain weight and then improved steadily.

A roentgenogram of his heart taken in July 1936 was negative.

The condition in this case would seem to be the result of a multiple deficiency. The expected rapid response to vitamin B_1 was not evident in the heart.

CASE 3.—A Negro boy aged 2 years was admitted to the hospital in November 1931, with a history of periods of swelling which had occurred for the past year. The last episode began a week before his admission. The daily diet included 1 pint (473 cc.) of milk, with cereals.

The child weighed 26 pounds and 4 ounces (11,907 Gm.). Examination showed anasarca, a large liver, a few rales, a questionable blood pressure of 130 systolic and 110 diastolic and a large heart without murmurs. The knee jerks were absent.

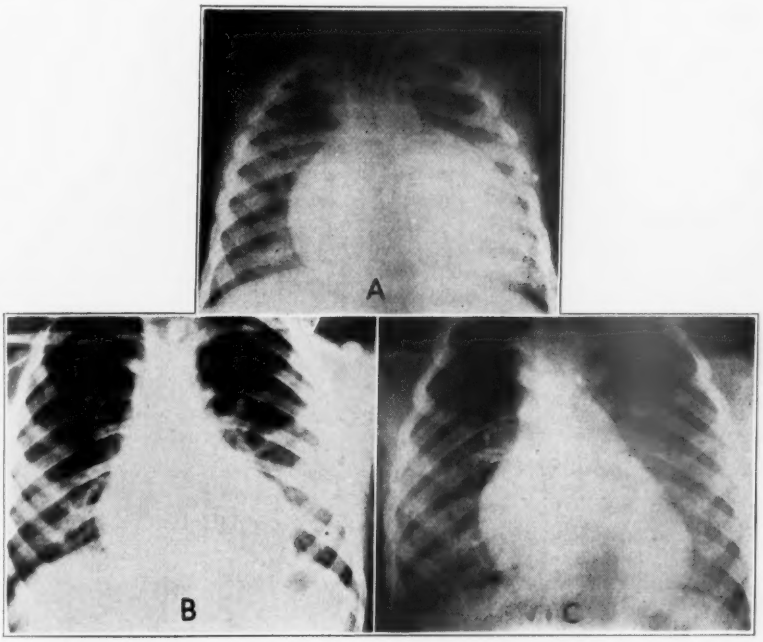

Fig. 2 (case 2).—*A*, roentgenogram taken on admission; *B*, one taken twenty-one months later and *C*, one taken four years later.

A roentgenogram confirmed the impression of cardiac enlargement. The urine showed albumin and casts but in four days became normal. A blood culture was negative. The serum proteins were not remarkable.

The infection of the respiratory tract persisted, and the edema remained for twenty-four days, with a fluctuating weight. The liver continued to be large and the blood pressure elevated (132 systolic and 100 diastolic). The child finally improved, though the cardiac enlargement did not disappear. After ninety days he was discharged in good condition, except for the enlarged heart.

This illness was questionably nutritional in origin. There was no rapid response in the cardiac condition when a proper diet was given.

CASE 4.—A Negro boy aged 21 months, admitted to the hospital in February 1931, had had fever and a cold with dyspnea and swelling for three weeks. His diet was condensed milk and cereals.

He was drowsy. Rales were scattered in both lungs; there was a questionable blood pressure of 122 systolic and 82 diastolic, the knee jerks were absent and the heart was enlarged, chiefly to the left.

After the child was put on a diet which included yeast and cod liver oil, he lost his edema in five days, his blood pressure fell to 82 systolic and 56 diastolic and in forty days he was discharged, apparently well.

About a month later he returned to the hospital in the same condition as on his first admission. The knee jerks were again absent. The liver was enlarged, as was the heart. On the second day transient hemiplegia developed and a murmur appeared over his heart. The urine was normal. The Mantoux test was positive. He lost a pound (454 Gm.) and was discharged improved, to return in three weeks with the hemiplegia definitely developed, a large liver, no knee jerks and a large heart without murmurs. A roentgenogram showed the heart to be still large but smaller than before. The child slowly improved, but he remained hemiplegic.

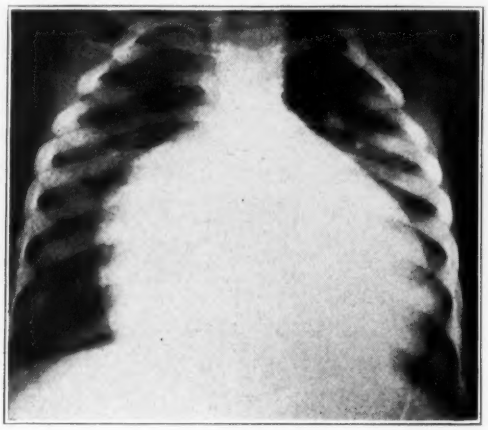

Fig. 3 (case 4).—Roentgenogram taken on admission.

CASE 5.—A Negro boy aged 18 months admitted to the hospital in January 1931 had been fed chiefly condensed milk. He weighed 19 pounds and 12 ounces (8,958 Gm.). His feet had been swollen for six weeks, and he showed general edema and dyspnea when admitted. His blood pressure was 108 systolic and 84 diastolic, and there were rales in his lungs. About his wrist was a symmetrical pigmented rash. The knee jerks were absent, and the heart was enlarged, as shown by percussion and in roentgenograms. The urine showed only a few casts.

On a good diet the child lost a pound in ten days. The knee jerks appeared after eight days, and general improvement was apparent.

The heart remained large. The child was discharged, and his subsequent history is unknown.

CASE 6.—A Negro boy aged 2 years had fever and swelling with drowsiness and anorexia for eight days before admission to the hospital. He weighed 25 pounds and 12 ounces (11,680 Gm.) and had rales in both lungs, a blood pressure of 100 systolic and 80 diastolic, no knee jerks, a large liver and an extremely large heart, demonstrated in roentgenograms. The urine showed little or no abnormality.

The patient was put on a good diet including brewers' yeast. The edema was gone two days later; the appetite returned, and the child was ready for discharge after four weeks. The heart seemed to be reduced in size.

This child died subsequently at home of causes unknown but thought to be cardiac.

CASE 7.—A Negro girl aged 19 months was admitted to the hospital in August 1933. She had diarrhea for five days previously and swelling of her face for one day. Her liver was enlarged, extending 5 cm. below the costal margin. Her heart was much enlarged to percussion, and she had general edema and active knee jerks. Parietal bossing and enlarged epiphyses were evident. The hemoglobin content was 85 per cent.

Her diet had been breast milk for seven months and then hominy, rice and occasionally milk.

On the day of admission to the hospital she had a convulsion and died. The autopsy showed a considerable amount of straw-colored fluid in both pleural cavities. The pleurae were edematous and the lungs firm and indurated throughout. There

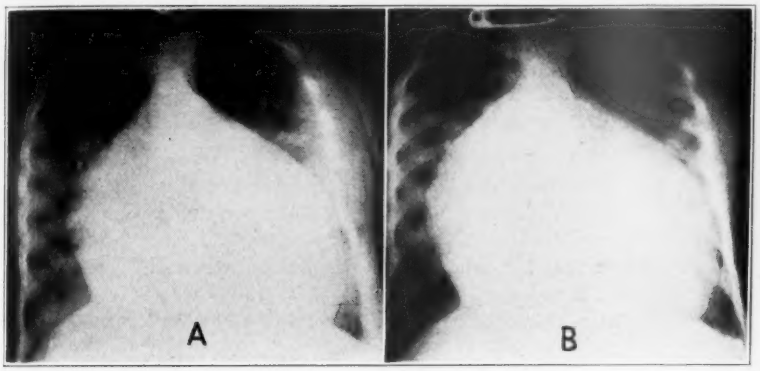

Fig. 4 (case 5).—*A*, roentgenogram taken on admission; *B*, taken thirty-six days later.

were some congestion and lumpiness in the base of each lung. The heart was moderately large, without evidence of hypertrophy of either chamber. There was hyperplasia of the lymph follicles of the intestinal wall and of the mesenteric lymph glands. The thymus was large. Microscopic examination showed that the fibers of the heart were large and the texture was loose.

CASE 8.—A Negro girl aged 2 years, admitted to the hospital in February 1936, had been sick for ten days with a cough and had been swollen for one day. Her diet was 8 ounces (227 cc.) of milk and scanty miscellaneous foods daily. Her heart was enlarged to the left, and she had edema of her face and extremities. The urine was normal. The serum proteins were somewhat reduced. A roentgenogram showed a heart enlarged to the left. On a diet including brewers' yeast the child lost her edema in a few days and lost and later gained weight. A roentgenogram of the heart taken nine days after the first examination showed it to be somewhat smaller but not yet of average size.

CASE 9.—A Negro girl aged 2 years and weighing 22 pounds (9,979 Gm.) was admitted to the hospital in November 1934, with a history of varying swelling

and dyspnea. Her diet had been extremely limited. Her urine was normal. A roentgenogram showed an enlarged heart. The blood pressure was 104 systolic and 80 diastolic. The patient was put on a good diet, and the edema disappeared in four days. The child lost weight and then gained weight.

CASE 10.—A white boy aged 2½ years and weighing 22½ pounds (10,206 Gm.) was admitted to the hospital in September 1929, with a history of mild diarrhea and swelling. Examination showed edema of the face and of the lower extremities, sluggish knee jerks, scattered rales, an enlarged liver and a large heart without murmurs. The urine was normal. Three days after the child was put on a full diet including wheat germ sugar his edema was gone. The heart gradually grew smaller, and the child gained 5 pounds (2,269 Gm.) in twelve days.

CASE 11.—A Negro girl aged 24 months was admitted to the hospital in September 1934, weighing 24 pounds (10,886 Gm.). Her diet had been scanty. She was said to have had a fast heart for six weeks and dyspnea and swelling for three weeks. Her heart was enormously enlarged, its rate was 150, and both the liver and the spleen were large. The urine was normal, and the blood showed little abnormality except sickling of the red cells. An electrocardiogram showed left axis deviation. The blood pressure was 100 systolic and 70 diastolic. After the patient was put on a diet high in protein and including brewers' yeast, the size of the heart was gradually reduced. The child lost 3 pounds (1,307 Gm.) and then gained 4 pounds as she improved over a period of nine weeks.

This patient died at home in December 1935, of causes unknown.

CASE 12.—A Negro boy aged 2 years was admitted to the hospital in November 1934, weighing 22 pounds (9,979 Gm.). He had been swollen for a month and had had some fever and vomiting, drinking much water and passing little urine. His heart was not enlarged to percussion, though his liver extended 2 cm. below the ribs. His urine was normal. After being put on a good diet he lost edema rapidly, gained weight and was discharged.

Two months later he returned, with a history of dyspnea, fever and swelling of the abdomen, feet and face of about three weeks' duration. He weighed 23 pounds (10,433 Gm), was noticeably dyspneic and had scattered rales and broncho-vesicular breathing over both lungs. He died a few hours after admission.

The autopsy showed general edema. There was about 50 cc. of straw-colored fluid in the abdominal cavity, about 75 cc. in each pleural cavity and 50 cc. in the peritoneal cavity. The thymus was large. The smaller bronchi contained a little purulent fluid.

The heart was enlarged, and the chambers were uniformly dilated. The valves were normal. The myocardium of the left ventricle was about 1 cm. thick; that of the right ventricle was slightly thinner. The myocardium was pale and flabby.

The stomach showed a few small scattered ulcerations.

Microscopic examination showed that the cardiac muscle cells were pale and swollen, somewhat granular and in many instances fragmented. The specialized epithelial cells of the convoluted tubules were swollen and granular. In the spleen the malpighian corpuscles were surrounded by a large zone of hemorrhage, and there were numerous sickle cells in the sinuses.

CASE 13.—A Negro girl aged 4 years was admitted to the hospital in May 1935. She weighed about 29 pounds (13.2 Kg.). For several months she had not been well, and a month before admission she had some transient generalized swelling. Her heart had been thumping. It was large, and the liver extended 2 cm. below the costal margin. Her knee jerks were absent. Her urine contained albumin. An electrocardiogram showed a tendency to low voltage in all complexes and a

flattening of the T wave in all leads. A roentgenogram confirmed the impression of general cardiac enlargement. After the patient was put on a general diet including brewers' yeast, improvement was steady, and she was discharged in sixteen days.

In January 1937 she was readmitted to the hospital. She weighed 38 pounds (17.2 Kg.). Her heart was still slightly enlarged, though much smaller than it was on her previous admission. There were no murmurs or arrhythmias. The blood pressure was 88 systolic and 50 diastolic. An electrocardiogram showed a positive P wave in leads I and II, an inverted P wave in lead III, left axis deviation, a positive T wave in leads I and II and an inverted T wave in lead III. During a stay of eight days in the hospital, she seemed well and active and showed no further cardiac changes.

On being examined in June 1937 she showed no evidence of her previous difficulties except moderate general malnutrition.

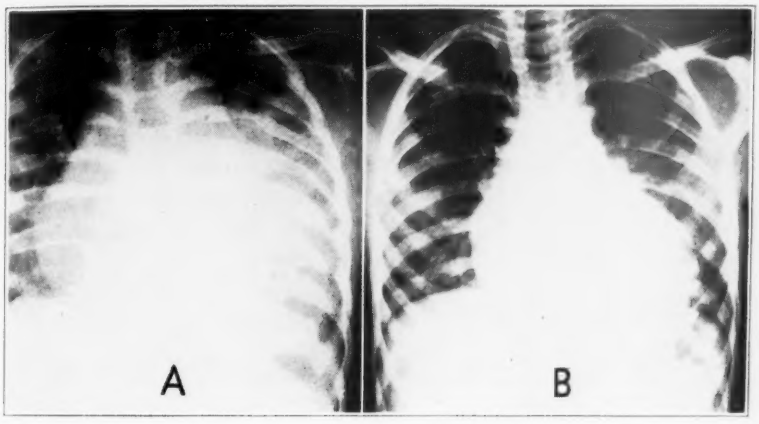

Fig. 5 (case 13).—*A*, roentgenogram taken on the first admission; *B*, taken on the second admission.

In this small series of cases scurvy was not evident and rickets was not apparently active. In some of the cases the size of the enlarged heart decreased fairly rapidly, though not as a rule as fast as the general edema disappeared, and in some cases the enlargement persisted for weeks or longer. This fact would suggest that the enlargement was sometimes due to some factor other than ordinary edema of the cardiac muscle, perhaps to hypertrophy which gradually subsided or perhaps even to some process which left more or less permanent cardiac damage.

In only three of the eight cases in which the protein content of the blood was measured was there marked variation from normal levels. In case 2, case 8 and case 13 was seen the change of the relation between albumin and globulin which is generally found in nutritional edema, but after a week of treatment the ratio of these proteins in case 13

was still about the same. The disturbance of this ratio occurred in only six of thirteen patients with nutritional edema who had no evident cardiac changes and who were of approximately the same age.

TABLE 1.—*Summary of Chemical Findings in the Blood*

Case	Urea	Sugar	Serum Albumin	Serum Globulin	Total Serum Proteins	Wassermann Test	Chloride	Cholesterol	Calcium
1	..	..	4	2.2	7.2	Negative	...	...	..
2 (1st admission)	..	..	....	....	....	++++	...	...	..
(2d admission)	..	..	3.05	4.08	7.04	++++	...	...	..
3 (1st admission)	..	..	3.5	2.9	7.9	.....	...	...	..
(2d admission)	..	..	3	2.8	7.4	None	...	...	..
4	11	..	....	....	....	Negative	...	...	..
5	..	..	....	....	....	.....	...	...	..
6	..	..	....	....	....	Negative	...	...	..
7 (No laboratory examinations)			....	....	....	None	...	...	..
8	7	..	2.27	3.19	5.95	Negative	...	...	10
9	16	67	....	....	6.09	Negative	...	...	..
10	16.1	83	4.04	2.66	6.88 (after 1 wk.)	.....	424	292	..
11 (1st admission)	12	79	3.66	2.54	6.46	Negative	...	...	..
(2d admission)	..	..	5.02	3.21	8.20 (2 wks. later)	.....	...	...	..
12	16	67	4.04	2.66	6.88	Negative	...	...	..
13 (2d admission)	8	95	2.96 3.73	2.85 3.65	6.77 8.25 (8 days later)	.....	...	...	..

TABLE 2.— *Summary of Laboratory Findings*

Case No.	Urine	Hemoglobin (Dare)	Total Leukocytes	Polymorphonuclears	Lymphocytes	Monocytes	Transitional Forms	Basophils	Eosinophils
1	1st admission neg. 2d admission neg.	60	13,250	60	30	10	..	..	..
2	1st admission neg. 2d admission, 1st alb., 2d neg.	46 65	10,000 17,000	48 82	42 18	.. ..	4 ..	4 ..	20 ..
3	1st alb. +++, 2d neg.	35	10,000	55	27	..	18	..	..
4	1st admission, 1st alb. +, 2d neg. 2d admission neg.	50 40	19,150 16,000	57 57	43 39	.. 3	..	..	..
5	Casts +	70	17,605	45	52	3	..	..	..
6	1st alb. + casts +, 2d neg.	45	14,350	60	36	4	..	..	..
7	No laboratory examinations								
8	Neg.	62	6,600	60	38	2	..	..	..
9	Neg.	80	8,150	75	23	2	..	..	..
10	Neg.	50	7,550	73	22	4	..	..	..
11	1st admission alb. + casts. 2d admission neg.	57 78	11,700 16,850	67 54	21 36	12 8	.. 2	..	..
12	Neg.	80	8,150	75	23	2	..	..	..
13	1st admission alb. +++ 2d admission neg.	85 59	6,500 7,350	72 53	25 37	3 2	.. ..	.. 2	.. 6

All these patients improved on adequate diets strengthened with materials rich in vitamin B_1, such as brewers' yeast, wheat germ sugar and extract of rice polishings.

In addition to the cases of cardiac disorder mentioned, thirty-four cases of nutritional edema without evident cardiac disease were collected during the same period. None of the patients showed clinical enlargement of the heart, and none of the fifteen patients who had roentgen examination varied from the normal. These children had the same history of scanty diet and their condition ran the same general course as that of most cardiac patients. Their ages, with a few exceptions, fell into the same period as the ages of the cardiac patients. Undoubtedly some of them had cardiac changes which were not demonstrated. The reflexes were absent in eleven cases. The findings in regard to serum proteins were good, bad or indifferent. This fact suggests that some of these patients had essentially a deficiency of protein, some of them essentially a deficiency of vitamin B_1 and some of them a general and combined deficiency of dietary materials.

It is interesting to note that 83 per cent of the patients with nutritional disturbances were admitted to the hospial during the eight months from August to March inclusive, and that only 17 per cent came in during the four months from April to July inclusive, when dietetic materials are perhaps more varied and more available in this locality.

It has been said that in nutritional edema the total amount of serum protein and the albumin fraction are generally low while the amount of globulin is normal or increased.[10] It was reported that in guinea pigs with experimental beriberi the amount of albumin is reduced and the amount of globulin is normal or is increased.[11] Similar findings were obtained for subjects with experimental scurvy. Another report recorded the same condition in five human beings with illness diagnosed as beriberi.[12] However, it was stated elsewhere that the proteins are not decreased in human patients with beriberi.[13] Further, it was reported that water-soluble vitamin B_1 does not prevent or cure edema in rats kept on a low protein diet.[14]

A recent report indicates that, even though cardiac changes may not be clinically evident, there are definite electrocardiographic variations in epidemic dropsy. These are sinus tachycardia, sinus arrhythmia, a

10. Dodd, K., and Minot, A. S.: Edema in Infancy and Childhood as Expression of Chronic Dietary Insufficiency, J. Pediat. **8**:442-451 (April) 1936.

11. Corda, D.: Le modificazione della proteinemia e del quoziente proteico del sangue, nel beriberi e nello scorbuto sperimentali, Clin. pediat. **16**:547-566 (July) 1934.

12. Villela, G. G.: Proteines du plasma, calcium et cholesterol dans le béribéri, Compt. rend. Soc. de biol. **113**:1277-1279, 1933.

13. Turner, R. H., in discussion on Youmans, J. B.: Endemic Edema, J. A. M. A. **99**:883-887 (Sept. 10) 1932.

14. Kohman, E. A.: Experimental Production of Edema as Related to Protein Deficiency, Am. J. Physiol. **51**:378-405 (March) 1920-1921.

short PR interval, occasional auricular fibrillation, a coronary T wave and other abnormalities of the T wave suggesting myocardial damage.[15]

These inconsistent findings do not further the classification of the cases cited, nor do they indicate whether the edema is due to deficiency of vitamin B_1 or to lack of other materials.

SUMMARY

Nutritional heart disease is not uncommon among Negro children in Charleston, S. C. Thirteen cases summarized here suggest that the cardiac changes are due not entirely to a lack of vitamin B_1 but to a rather more general deficiency of dietary materials and that a satisfactory response to dietetic treatment may be expected in cases in which the illness is not too far advanced.

15. Chopra, R. N.; Chaudhuri, R. N., and De, N.: Electrocardiographic Changes in Epidemic Dropsy, Indian M. Gaz. **72**:1-3 (Jan.) 1937.

CONGENITAL HEART DISEASE

A CLINICAL AND POSTMORTEM STUDY OF ONE HUNDRED AND FIVE CASES

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Congenital anomalies of the heart have for centuries attracted the attention of anatomists. It is only in recent years that they have been intensively studied by clinicians. In bringing this subject into the field of clinical medicine the pioneer work of Dr. Maude E. Abbott has been most influential. Following her lead, numerous other investigators have submitted case reports and statistical studies which have served to throw increasing light on the incidence of congenital heart disease and of its various types and on the symptoms and physical signs of individual and of combined lesions.

Believing that further statistical studies along this line may be of value, we have thought it worth while to review the clinical and postmortem records of all children who have come to autopsy at the Children's Memorial Hospital during the past fifteen years. All of the patients were under 13 years of age.

In the period from Jan. 1, 1921, to Nov. 13, 1936, autopsies were performed on 1,950 infants and older children. Of these, 105 (5.4 per cent) were found to have congenital anomalies of the heart or of the great vessels. In fact, the number was slightly higher, as a few cases were rejected because of incompleteness of the pathologic report. We have not included cases of anatomically patent foramen ovale or cases of slightly patent ductus arteriosus in early infancy.

It is obvious that the incidence of congenital heart disease will be greater in the material from a children's hospital than in that from a general hospital. In a review of the postmortem records of the Johns Hopkins Hospital, Leech [1] found that in 13,115 autopsies 170 instances of congenital anomaly of the heart were encountered, an incidence of 1.29 per cent. McGinn and White,[2] reviewing 7,500 postmortem

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From the Cardiac Service of the Children's Memorial Hospital.

1. Leech, C. B.: Congenital Heart Disease: Clinical Analysis of Seventy-Five Cases from the Johns Hopkins Hospital, J. Pediat. **7**:802 (Dec.) 1935.

2. McGinn, S., and White, P. D.: Progress in the Recognition of Congenital Heart Disease, New England J. Med. **214**:763 (April 16) 1936.

examinations done at the Massachusetts General Hospital, found congenital cardiac anomalies in 67 instances, the incidence being 0.9 per cent. Terplan and Sanes [3] noted in 336 autopsies on infants up to 1 year of age 21 instances (6.3 per cent) of congenital cardiac lesion. Philpott [4] found that in 7,240 autopsies performed in Montreal hospitals during a ten year period 80 instances (1.1 per cent) of congenital anomaly of the heart were observed. He found, however, that the incidence of congenital heart disease was 4.7 per cent among infants who came to autopsy within the first twenty-eight days of life, 2.8 per cent among those between the ages of 1 month and 2 years and only 0.3 per cent in patients beyond 2 years of age.

The age distribution in our own series is shown in the table.

These statistics emphasize the relative frequency of congenital cardiac lesion in infancy and in early childhood.

Age Distribution of Congenital Heart Disease *

Age	Number of Autopsies	Number of Cases of Congenital Heart Disease	Percentage of Cases
First month	189	22	11.6
First month to 1 year	829	52	6.3
Second year	276	12	4.3
2-5 years inclusive	331	10	3.0
6-9 years inclusive	216	5	2.3
10-12 years inclusive	109	4	3.7

* In 1,950 autopsies, 105 instances of congenital heart disease were found.

Of our 105 children with congenital heart disease, 62 (59 per cent) were boys and 43 (41 per cent) were girls. Of the 1,950 children who came to autopsy, 1,132 (58 per cent) were boys and 818 (42 per cent) were girls. Thus it is seen that the sex distribution of the children with congenital heart disease paralleled very closely the sex distribution of all the children on whom autopsies were done.

In 24 cases there were no symptoms or signs suggestive of congenital heart disease, the postmortem findings being unexpected. In 81 cases symptoms or signs pointing to a cardiac anomaly were found. In 33 cases death was attributed to the cardiac lesion.

In commenting on the anomalies which we encountered, we shall group them according to the clinical classification formulated by Abbott. We shall consider first the examples of arterial-venous shunt. There were 23 instances of uncomplicated auricular septal defect, 17 of patent

3. Terplan, K., and Sanes, K.: The Incidence of Congenital Heart Lesions in Infancy, J. Tech. Methods **15**:86 (March) 1936.

4. Philpott, N. W.: Relative Incidence of Congenital Cardiac Anomalies in Montreal Hospitals, J. Tech. Methods **15**:96 (March) 1936.

ductus arteriosus and 12 of defect of the interventricular septum. There were 7 instances of defect of the interauricular septum associated with patent ductus arteriosus, and there were 5 cases of interauricular septal defect in conjunction with defect of the interventricular septum. In 1 case was seen a defect in the interventricular septum together with persistent bulbus cordis. Adding the foregoing figures shows that 65 of the 105 cases, or 62 per cent, were examples of arterial-venous shunt. Such lesions are relatively simple and benign and in the absence of complications are compatible with long life. Cyanosis is not anticipated, except as a transient or terminal phenomenon. Of the 65 children with arterial-venous shunt, 38 had intermittent or terminal cyanosis. Constant cyanosis occurred in only 2. Death was attributed to the cardiac lesion itself in 5 instances.

The symptomatology gives little aid when one attempts to determine the individual lesion in cases of arterial-venous shunt, but the signs revealed by cardiac examination may be distinctive. Every one is familiar with the harsh humming top murmur which is considered pathognomonic of patent ductus arteriosus. Yet this characteristic murmur is often absent. Abbott [5] says: "A systolic murmur appears to be the rule in infants and in extremely young children, in whom a continuous murmur is rare." We were surprised to find that of our 17 cases of uncomplicated patent ductus arteriosus, a humming top murmur was heard in only 1. The patient was 11 years old. In 11 cases no murmur was noted, and in 5 a systolic murmur was recorded. These facts stress the influence of age and perhaps also of the size of the defect on the production and on the character of the murmur. The majority of the patients with patent ductus were infants. The size of the defect was sometimes stated; in other cases the term "widely patent" was used. Our findings corroborate the statement that the characteristic murmur of patent ductus arteriosus is of slow evolution and is infrequently heard in infancy and early childhood. In addition, our findings indicate that even the systolic phase of the murmur may be absent for a considerable time.

In contrast to the frequent absence or atypical character of the murmur in cases of patent ductus arteriosus was the almost invariable presence of a characteristic murmur in cases of defect of the interventricular septum. A systolic murmur was noted in 11 of the 12 patients. In the single instance in which no murmur was heard, the patient was a 3 week old baby who was moribund on admission to the hospital and was probably examined hastily. The murmur present in cases of interventricular septal defect was described as systolic and

5. Abbott, M. E.: Atlas of Congenital Cardiac Disease, New York, American Heart Association, 1936, p. 32.

usually harsh, and it was heard over the body of the heart. In 9 instances death occurred during the first year. Hence, it may be concluded that the harsh systolic murmur heard best at about the third left interspace, which is considered to be diagnostic of defect of the interventricular septum, is established in early life.

Neither an open foramen ovale nor other defects in the interauricular septum produce characteristic physical signs. Because of the relatively feeble contraction of the auricles, it is easy to understand why a murmur may be absent, even if a considerable amount of blood traverses the defect. In some instances, however, a murmur is heard which is apparently due to this lesion. Of the 22 cases of defect in the interauricular septum, a murmur was heard in 7. It was usually described as systolic.

We shall now consider the more serious and complex anomalies in which there occurred a permanent venous-arterial shunt. The majority of this group fell into one of two classifications. There were 9 cases of complete transposition of the vessels, the aorta arising from the right ventricle and the pulmonary artery from the left ventricle. Under such circumstances arterial blood passes repeatedly to the lungs and venous blood is distributed to the tissues of the body. In order that life may be maintained, a communication must exist between the two circulations, allowing an admixture of arterial and venous blood. In the 9 instances of complete transposition of the vessels, the communications were as follows:

Defect of the interventricular septum	3
Defect of the interventricular septum and patent foramen ovale	2
Patent foramen ovale	1
Patent ductus arteriosus	1
Patent foramen ovale and patent ductus arteriosus	1
Fenestrations of foramen ovale	1

Five of the patients were cyanotic from birth, and the cyanosis was progressive. The others had intermittent and terminal cyanosis. A systolic murmur over the precordium was heard in 7 cases. Five patients died during the first month of life and 3 others during the first year. One patient reached the age of 2 years and 1 month. It is significant that in every case death was due to the cardiac lesion.

Next in frequency among the cases of venous-arterial shunt was pulmonary stenosis or atresia, with defect of the interventricular septum. This condition and the hypertrophy of the right ventricle and dextroposition of the aorta which are usually associated with it constitute the tetralogy of Fallot. There was a total of 8 cases, 4 with stenosis of the pulmonary artery and 4 with atresia. In all there was persistent cyanosis. In all save 1 there was a systolic murmur, usually

described as harsh and of maximum intensity at the base of the heart. All of the 8 patients succumbed to the heart disease itself. The youngest was 3 months of age, the oldest 8 years. The majority died during the first year.

The total number of children who exhibited venous-arterial shunt was 25. Of this number, 17 were included in the two groups just cited, namely, the group with complete transposition of the vessel and that with the tetralogy of Fallot. In the remaining 8 cases the following conditions were present:

1. Partial transposition, both the aorta and the pulmonary artery arising from the right ventricle
2. Partial transposition, both the aorta and the atresic pulmonary artery arising from the right ventricle
3. Infantile type of coarctation of the aorta
4. Persistent truncus arteriosus communis
5. Functional cor biatriatum triloculare (rudimentary right ventricle)
6. Biloculate heart
7. Tricuspid atresia
8. Mitral atresia

There were 15 cases in which no communication existed between the arterial and the venous circulation. Of these, in 3 there was aneurysm of the interventricular septum, in 2, fenestrations of the aortic valve and in 2, pulmonary stenosis. There was 1 case each of aortic stenosis, coarctation of the aorta, fused aortic cusps, double aortic arch, accessory right coronary artery, bicuspid pulmonary valve, triatrial heart and congenital idiopathic hypertrophy of the heart. Heart failure attributed to the cardiac anomaly occurred in 1 case of aneurysm of the interventricular septum and in the cases of double aortic arch, triatrial heart and congenital idiopathic hypertrophy of the heart.

We wish to mention at this point the relation between mongolism and congenital heart disease. It is well recognized that children with mongolism are much more often than other children the victims of a congenital anomaly of the heart. Some authors have stated that 1 of 6 persons with mongolism has signs of congenital heart disease. In our series there were 7 examples of mongolism. One patient had persistent ostium primum, and 1 had persistent ostium primum together with defect of the interventricular septum. These lesions have been found so frequently in association with mongolism as to be regarded as more or less characteristic of that condition. Yet there were 5 cases in which other lesions were revealed. In 2 cases patent ductus

arteriosus was noted, in 2 the tetralogy of Fallot and in 1 a localized defect of the interventricular septum.

The association of other congenital anomalies with congenital heart disease is frequent. In Abbott's [6] series of 1,000 cases, associated anomalies occurred in 18.8 per cent of the cases. In this series there were 28 children (27 per cent) who had anomalies elsewhere than in the cardiovascular system. No one anomaly occurred with unusual frequency, nor was any given type of congenital heart lesion associated with a particular type of anomaly elsewhere.

In this brief report we have shown the incidence of congenital heart disease and of its various types in our necropsy material, and we have commented on the physical signs which were recorded. A number of the cases included in this series have been reported more fully elsewhere. Kato [7] reported 5 cases of complete transposition of the vessels; Roos [8] described the case of persistent truncus arteriosus communis, and Gibson and Roos [9] described a case of open foramen ovale associated with acquired mitral stenosis.

SUMMARY

A review of 1,950 consecutive autopsies on children revealed 105 cases of congenital heart disease. The relative incidence of congenital heart disease was much greater in infants than in older children. Of the 105 cases, 65 were instances of arterial-venous shunt and 25 of venous-arterial shunt, and in 15 there was absence of shunt. Of the 65 instances of arterial-venous shunt, 23 were pure defect of the interauricular septum, 17 consisted of patent ductus arteriosus, 12 of defect of the interventricular septum and 13 of combined lesions. Symptoms were late or absent. The only characteristic auscultatory finding was that obtained in cases of defect of the interventricular septum. A harsh systolic murmur over the precordium was heard in practically every case of this type. The rarity of the humming top murmur in cases of patent ductus was surprising.

The majority of the children who had permanent venous-arterial shunt presented one of two conditions: complete transposition of the

6. Abbott, M. E.: Congenital Heart Disease, in Nelson Loose-Leaf Living Medicine, New York, Thomas Nelson & Sons, 1927, vol. 4, pp. 207-321.

7. Kato, K.: Congenital Transposition of Cardiac Vessels: A Clinical and Pathologic Study, Am. J. Dis. Child. **39**:363 (Feb.) 1930.

8. Roos, A.: Persistent Truncus Arteriosus Communis: Report of a Case with Four Semilunar Cusps and Aortic Arch on the Right Side, Am. J. Dis. Child. **50**:966 (Oct.) 1935.

9. Gibson, S., and Roos, A.: Open Foramen Ovale Associated with Mitral Stenosis, Am. J. Dis. Child. **50**:1465 (Dec.) 1935.

great vessels or the tetralogy of Fallot. All were cyanotic; the span of life was brief in the majority, and all died a cardiac death.

Of the 15 children whose cardiac lesion did not allow abnormal communication between the systemic and the pulmonary circulation, some were free of symptoms and signs, while others succumbed to heart failure.

Cardiac findings in the 7 cases of mongolism showed a variety of anatomic lesions.

Associated congenital anomalies were found in 28 cases.

Dr. Irving J. Wolman furnished a detailed description of the congenitally anomalous hearts preserved in the museum, and Dr. William H. Hibbs, attending pathologist, gave permission to review the records of autopsies.

PROPHYLAXIS AGAINST MEASLES WITH THE GLOBULIN FRACTION OF IMMUNE HUMAN ADULT SERUM

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In the preparation of an antibody concentrate of a serum, it is the globulins which are utilized, since the antibodies either are globulins or seem to be exclusively associated with this fraction of the blood serum. McKhann and Chu [1] applied this knowledge to the human placenta. They separated the globulins from human placenta and found them to be effective in the prophylaxis of measles. In work previously reported I attempted to show that the globulin fraction of immune human adult blood serum is effective in prophylaxis against measles. The following is a summary of the method used in the earlier work:

The globulins were precipitated from a batch of pooled serum, and after dialysis the precipitate was taken up in a physiologic solution of sodium chloride. Merthiolate was added in the proportion of 1:7,500. The volume of the solution was brought up to the volume of the original serum by the further addition of physiologic solution of sodium chloride. A culture of the fluid was sterile. The efficacy of this solution in prophylaxis of measles was determined in a small number of children [2] and was compared with the efficacy of equivalent amounts of the original serum.

The injection of the globulin solution was associated with considerable local discomfort and frequently with transitory general reaction. The results indicated, however, that this globulin fraction of human serums was no less effective than equal volumes of the original serums. This study suggested that practical application of globulin fractions of measles immune adult serum could be made if the unpleasant reactions could be eliminated and if further tests confirmed its efficacy. Globulin solutions of greater concentration seemed more practical. I proceeded to prepare a solution which would have one sixth of the volume of the original serum and therefore would have greater concentration.

This work was aided by a grant donated in memory of James Lucien Loewenthal.

Read at the meeting of the Society for Pediatric Research at Atlantic City on May 4, 1937.

1. McKhann, C. F., and Chu, F. T.: Use of Placental Extract in Prevention and Modification of Measles, Am. J. Dis. Child. **45**:475-479 (March) 1933.

2. Karelitz, S.: Proc. Soc. Exper. Biol. & Med. **31**:793-796, 1934.

Three liters of immune adult serum was obtained from thirty young, healthy blood donors, free from syphilis and from tuberculosis, all of whom were reasonably certain that they had had measles in childhood. The blood obtained from each donor gave negative Wassermann and Kline reactions. Thirty cubic centimeters of serum from each donor was retained for testing in prophylaxis of measles so that it might be ascertained whether each donor really had had the disease. All the samples tested were found to be effective.

PREPARATION OF SERUM GLOBULIN [3]

Serum 1.—Nine hundred and sixty cubic centimeters of serum was diluted with an equal volume of distilled water and was precipitated with 1,920 cc. of a saturated solution of ammonium sulfate. This was filtered. The precipitate was pressed, 2 cc. of chloroform was added and the preparation was dialyzed. One hundred and sixty cubic centimeters was recovered. One per cent sodium chloride, 0.5 per cent phenol, 0.6 per cent ether and merthiolate in the proportion of 1: 20,000 were added. The precipitate which formed on standing, presumably consisting of fatty substances, was removed. The extract was filtered through paper pulp and through an N Berkefeld filter. One hundred and twenty cubic centimeters of sterile extract was recovered. This was bottled in vials containing 2.5 and 5 cc. Assuming that there was no loss in the substance prophylactic against measles, 2.5 cc. of this solution should be equivalent to 15 cc. of the original adult serum.

Serum 2.—Preparation of serum globulin 2 differed from that of serum globulin 1 in several ways. First, the acid proteins were removed from serum 2; second, the entire procedure of fractionation was repeated with serum 2 because of difficulty in eliminating the fatty substances which separated out, and third, the final preparation had one tenth, whereas serum 1 had one sixth, of the volume of the original serum. Acid proteins were removed for two reasons: to minimize the reactions observed with the diluted globulins and to reduce the volume of the solution.

The globulin solution and the original serums were tested for their efficacy in prophylaxis of measles by being injected intramuscularly in various amounts into children intimately exposed to sick siblings in their own homes. The contact with measles in all of these cases was close. It lasted from three to seven days and, in a few instances, eight days or longer. Allowance was made for duration of exposure in dosage or in evaluation of results. Serum globulins 1 and 2 were tested between December 1936 and May 1937.

DOSAGE

The dose of serums 1 and 2 varied between 1.5 and 7.5 cc. and was one sixth and one tenth, respectively, of the indicated dose of immune adult serum. Thus, if a child required 15 cc. of immune adult

3. This serum was made available by Dr. William Thalhimer of the Manhattan Convalescent Serum Laboratory of New York.

serum, 2.5 cc. of serum globulin 1 or 1.5 cc. of serum globulin 2 was injected. According to previously collected data,[4] the dosage of immune adult serum was calculated from the following rules: For a child of 3 years or less, 12 to 15 cc. of serum or plasma is indicated, the amount varying directly with the size of the child. Four or five cubic centimeters is added for each year above 3. The maximum dose recommended is from 48 to 60 cc. A modification to half of the standard dose is suggested if the serum is injected before the sixth day of exposure;

TABLE 1.—*Comparison of Results Obtained in Prophylaxis of Measles with Immune Adult Serum and with an Equal Volume of the Globulin Fraction of Immune Adult Serum*

	Protection	Modification	Failure	Total
Adult serum, 8 cc.	18-41%	17-39%	9-20%	44
Globulin solution, 8 cc.	12-50%	10.42%	2-8%	24

TABLE 2.—*Tabulation of Results Obtained with Concentrated Globulin Fraction of Immune Adult Blood*

Serum		Results Expected	Results Obtained
1	Protected	17	21
	Modified	20	16
	Failed	2	2
	Total	39	39
2	Protected	22	17
	Modified	11	15
	Failed	2	3
	Total	35	35
Total	Protected	32	31
	Modified	33	33
	Failed	4	5
	Total cases	74	74

two thirds or all of the standard dose should be used if given on the sixth or seventh day.

The original dilute globulin solution referred to in table 1 was injected in doses of 8 cc., and the results were compared with those obtained with equivalent amounts of the original serums, tested under similar conditions.

The globulin fraction of immune adult serum was injected into a total of ninety-eight subjects (tables 1 and 2). Complications were one case of pneumonia, in a subject inoculated on the ninth day of exposure, and one case of mild otitis, in a patient with modified measles. The usual criteria for modification were fulfilled.

4. Karelitz, S.: New York State J. Med. **35**:876-880 (Sept. 1) 1935.

RESULTS

The data in the tables indicate that good results may be expected in prophylaxis of measles with the globulin fraction of immune adult serum. Thus, results obtained with the dilute solution of globulin were similar to those obtained with equivalent volumes of the original serums tested under comparable conditions.

TABLE 3.—*Individual Results Obtained with Serum Globulin*

Age	Number of Days Exposed	Date Injected	Amount of Extract, Cc.	Adult Serum Equivalent, Cc.	Result	Expected Result
5 yr.	2	12/ 5/36	2.5	15	Protected	Modified
6 yr.	6	2/10/37	2.5	15	Modified	Modified
2½ yr.	6	2/10/37	2.5	15	Modified	Modified
10 yr.	6	3/ 9/37	7.5	45	Modified	Modified
3½ yr.	7	4/ 6/37	2.5	15	Protected	Modified
4 yr.	7	4/ 6/37	2.5	15	Protected	Modified
5 yr.	4	4/ 6/37	2.5	15	Modified	Modified
14 yr.	5	4/ 8/37	5.0	30	Protected	Modified
14 yr.	5	4/ 8/37	5.0	30	Protected	Modified
3 yr.	7	4/ 9/37	2.5	15	Protected	Protected
6 yr.	4	4/10/37	2.5	15	Protected	Modified
22 mo.	6	4/13/37	2.5	15	Modified	Modified
8 yr.	12	4/15/37	3.0	20	Failure	Failure
2 yr.	5	4/15/37	2.5	15	Modified	Modified
5 yr.	13	4/15/37	2.5	15	Failure	Failure
4 yr.	5	4/15/37	2.5	15	Modified	Modified
6 yr.	6	2/17/37	2.5	15	Modified	Modified
1 yr.	5	2/16/37	2.5	15	Modified	Protected
6 yr.	5	2/19/37	2.5	15	Modified	Modified
2 yr.	3	2/20/37	2.5	15	Modified	Protected
21 mo.	4	2/19/37	2.5	15	Protected	Protected
9 mo.	6	2/27/37	2.5	15	Protected	Protected
3¼ yr.	4	2/28/37	3.0	20	Protected	Protected
4 yr.	4	3/ 9/37	2.5	15	Protected	Modified
1¼ yr.	4	3/ 9/37	2.5	15	Protected	Protected
4¼ yr.	4	3/ 9/37	3.0	20	Protected	Protected
5½ yr.	4	3/ 9/37	3.0	20	Protected	Modified
5½ yr.	4	3/ 8/37	3.0	20	Protected	Modified
3 yr.	4	3/10/37	2.5	15	Modified	Protected
2½ yr.	4	3/12/37	2.5	15	Modified	Protected
3 yr.	4	3/13/37	2/5	15	Modified	Protected
18 mo.	4	3/31/37	2.5	15	Protected	Protected
11 mo.	4	4/ 1/37	2.5	15	Protected	Protected
3 yr.	4	4/ 2/37	2.5	15	Modified	Protected
10½ mo.	4	4/ 4/37	2.5	15	Modified	Protected
12 yr.	4	4/22/37	5.0	30	Protected	Modified
10 yr.	4	4/25/37	5.0	30	Protected	Modified
3 yr.	5	5/ 3/37	2.5	15	Protected	Protected
12 yr.	5	5/ 7/37	7.5	45	Protected	Protected

	Protection	Modification	Failure	Number
Results obtained	21	16	2	
Results expected	17	20	2	
Total cases				39
Cases in which complete protection was obtained when modification was expected				10
Cases in which modified measles occurred when complete protection was expected				7

If one analyzes compositely the results obtained with serum globulins 1 and 2, there appears a rather striking similarity between the results obtained and those expected. Of a total of seventy-four subjects, thirty-eight remained well, thirty-one had modified measles and five had unaltered measles, whereas thirty-nine instances of complete protection, thirty-one cases of modified measles and four failures had been expected. If one omits the four cases in which expected failures

occurred, a beneficial effect, either modification of the disease or complete protection from it, was obtained in sixty-nine of seventy cases, or in 98.5 per cent of all cases. Only one subject inoculated before the eighth day of exposure failed to show any amelioration of measles.

If serum globulins 1 and 2 are subjected to separate analysis, the results are still satisfactory. It is obvious, however, that several attempts

TABLE 4.—*Individual Results Obtained with Serum Globulin 2*

Age	Number of Days Exposed	Date Injected	Amount Adult Serum of Extract, Equivalent, Cc.	Cc.	Result	Expected Result
2½ yr.	4	2/23/37	1.5	15	Modified	Protected
3¾ yr.	4	3/10/37	2.0	20	Protected	Protected
3 yr.	4	3/15/37	2.0	20	Modified	Protected
2½ yr.	7	4/ 1/37	2.5	25	Protected	Protected
4 yr.	4	4/ 7/37	3.0	30	Failure	Protected
2½ yr.	4	4/ 6/37	2.0	20	Modified	Protected
6 yr.	5	4/ 7/37	3.5	35	Protected	Protected
3 yr.	7	4/12/37	3.5	35	Modified	Protected
10 mo.	3	4/19/37	1.5	15	Protected	Protected
1 yr.	9	4/ 6/37	2.0	20	Failure	Failure
3 yr.	7	4/ 8/37	2.0	20	Modified	Modified
5 yr.	7	4/ 8/37	3.0	30	Protected	Modified
6 yr.	5	4/ 8/37	2.7	27	Protected	Protected
1½ yr.	5	4/ 8/37	2.0	20	Protected	Protected
9 yr.	7	4/ 9/37	3.0	30	Protected	Modified
2¾ yr.	7	4/ 9/37	1.5	15	Protected	Modified
13 mo.	7	4/ 9/37	1.5	15	Protected	Protected
3 yr.	6	4/13/37	1.6	16	Modified	Modified
5 yr.	6	4/13/37	2.5	25	Modified	Modified
7 yr.	5	4/14/37	2.0	20	Protected	Modified
18 mo.	5	4/14/37	1.5	15	Modified	Protected
32 mo.	5	4/14/37	1.5	15	Modified	Protected
4 yr.	5	4/14/37	2.0	20	Modified	Modified
5 yr.	13	4/15/37	2.0	20	Failure	Failure
8½ yr.	4	4/24/37	3.0	30	Modified	Modified
7½ yr.	4	4/24/37	3.0	30	Modified	Modified
3½ yr.	4	4/24/37	2.0	20	Modified	Protected
2 yr.	4	4/24/37	1.7	17	Protected	Protected
14 yr.	4	4/ 1/37	4.5	45	Protected	Modified
2 yr.	4	4/10/37	1.5	15	Protected	Protected
15 mo.	4	4/10/37	1.5	15	Modified	Protected
18 mo.	4	4/12/37	1.5	15	Protected	Protected
2 yr.	4	4/30/37	1.5	15	Modified	Protected
3 yr.	4	5/ 7/37	2.0	20	Protected	Protected
3 yr.	5	5/ 7/37	2.5	25	Modified	Protected

	Protection	Modification	Failure	Number
Results obtained	16	16	3	
Results expected	22	11	2	
Total cases				35
Cases in which complete protection was obtained when modification was expected				5
Cases in which modified measles occurred when complete protection was expected				10

at modification of measles resulted in complete protection, and that some attempts at complete protection resulted in modification. There were more instances of complete protection when modification was expected after serum globulin 1 was used than when serum 2 was injected. This indicated that serum 1 was more potent than serum 2. This same impression was gained during observation of the cases of modified measles. The degree of modification of the disease seemed

greater when serum globulin 1 was used as compared with the results obtained from serum 2. Further comparison of the results obtained with serums 1 and 2 indicate that little or no loss of measles antibodies or of protective substance occurred in preparation of serum 1 and that in preparation of serum 2 a small but definite loss must have occurred. Perhaps the repetition of the entire procedure of fractionation in preparation of serum 2 was the cause of the loss. It may be recalled that there seemed to be no loss of antibodies in preparation of the dilute globulin solution previously referred to. It would seem, therefore, that unnecessary processing should be avoided and that the attempt to reduce the volume of a given amount of serum globulin to a minimum is associated with loss of measles antibodies. It is probably better and more nearly correct to assume a loss of 10 per cent of the protective antibodies in the preparation of these globulin solutions and to allow for this loss in the dosage. The more complicated the process of fractionation to which the immune adult serum is subjected, the more necessary it is to take into account a loss of measles antibodies.

Although the total number of subjects inoculated with the globulin preparations was not large, the results were significant because of the conditions of experimentation. Most of the children inoculated with serums 1 and 2 were brothers and sisters of children admitted to the measles pavilion of a hospital for patients with contagious diseases, and, with few exceptions, they had been exposed for at least four days. The housing conditions of most of these children were bad, crowding being the common fault. The significance of such poor hygienic conditions in evaluation of a substance prophylactic against measles has been pointed out in previous reports.[5] If a preparation is found to be effective under such conditions of hygiene, it may be expected to be at least as effective when exposure to measles is less intimate and shorter. In all eight controls measles developed. Two of the eight were adults, and one was a 3½ month old infant. The baby had a definitely modified type of measles, possibly because it still retained some of the immunity with which it was born.

REACTIONS

In none of the children inoculated with serum globulin 1 or 2 was there any local reaction at the site of injection, and in no instance was there any general reaction. This was equally true with use of the preparation containing the acid proteins and with use of the one from which the acid proteins had been removed. This lack of reaction is in striking contrast to the severe local and general reactions obtained with

5. Karelitz, S., and Schick, B.: Epidemiologic Factors in Measles Prophylaxis, J. A. M. A. **104**:991-994 (March 23) 1935; Wien. med. Wchnschr. **82**: 1395-1396 (Nov. 5) 1932.

the whole globulin preparations of placenta and the less severe but definite reactions obtained with equal volumes of the more refined commercial preparation of placental globulin.[6]

SUMMARY AND COMMENT

The globulins were removed from three pools of measles immune adult serum and were prepared in volumes equal to one sixth of and one tenth of the original volume of the serum. They were tested in ninety-eight children susceptible to measles intimately exposed to the disease in the home. The results obtained with the concentrated preparations were definite and striking. Only one child inoculated before the eighth day of exposure failed to show any amelioration of the disease after a suitable injection of serum 1 or 2. Neither local nor general reactions to the injection of the more concentrated filtered preparations were observed. This absence of reaction was in striking contrast to the painful reactions encountered with the use of the more dilute preparation. Removal of the acid proteins seemed to make no significant difference in the reactions or in the results. No appreciable loss of measles antisubstance seemed to result from the processing of the serum, except when the procedure of fractionation was repeated and the acid proteins were removed, as in preparation of serum 2. Elimination of the unpleasant reactions previously experienced with the original dilute preparation may have been due to the difference in preparation; possibly it resulted from the filtration through paper pulp and through the N Berkefeld filter.

Further trial of the globulin fraction of immune adult serum is recommended in the prophylaxis of measles for the following reasons:

1. It has been efficacious in doses easily calculated from the known indicated doses of immune adult serum.

2. It is easily prepared from immune adult blood, which is available in abundance at all times, whereas measles convalescent serum is difficult to obtain in adequate amounts.

3. It can be prepared in any fairly well equipped hospital laboratory with little, if any, loss of measles antisubstance.

4. The amount of the injection is small compared with the amount of immune adult serum injected, and the serum may be prepared so that the dosage is equal to or less than that of measles convalescent serum; thus the procedure of inoculation is simple.

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6. A globulin preparation, serum 3, with one fifth of the volume of the original serum is now being tested. To date the results are favorable, and no reactions have occurred in thirteen children treated under the supervision of Professor Delré, of Paris, and in twenty treated by myself.

5. The danger of infecting a child with syphilis, with tuberculosis or possibly with other diseases is eliminated. Infection occasionally occurs with the use of whole blood.

6. The reactions are less severe and the results more uniform than those which I observed after injecting equally small doses of commercial solutions of placental globulin.

7. The solutions of adult serum can be transported and can be stored at icebox temperature without loss of potency for at least one year, the longest time which has elapsed between obtaining the immune adult serum and testing the globulin solutions.

Mr. A. J. Klein, in Dr. K. G. Falk's division of the Research Laboratory of the Department of Health of the city of New York, prepared the globulin solutions according to specifications. In this and in earlier related work he was assisted by Mr. Andrew Mackey. Dr. R. S. Muckenfuss, director of the Research Laboratory, cooperated in this work.

DISCUSSION

DR. J. D. TRASK, New Haven, Conn.: Were those two series of tests done the same year, Dr. Karelitz?

DR. S. KARELITZ, New York: Yes. From December 1936 to May 1937.

DR. A. C. MCGUINNESS, Philadelphia: One of the difficulties that is encountered in the Serum Exchange in Philadelphia with much of the serum is the cost of producing the finished product, that is, payment to the donor plus the cost of volatilizing the serum. I wonder if the cost of putting the serum through this particular process would not be so high as to make the final price to the consumer beyond the reach of the ordinary person.

DR. S. KARELITZ, New York: The serum was bought by Dr. Thalhimer for $10 a pint. As for the cost of the actual processing, I see Dr. Thalhimer in the audience. He could probably answer that better than I could, but I do not believe that the final cost would be any greater than the present price of, for example, placental extract.

DR. W. THALHIMER, New York: The cost of the original blood is the same no matter what the ultimate process is, and the cost of this globulin-extracting process itself is very small. The main cost in processing it is the cost of labor, and as I understand it, through Dr. Falk, who is in charge of the chemistry division of the research laboratory of the Department of Health, the service of a skilful technician who has been properly trained is all that is necessary.

As a matter fact, in comparison with the processing of the wet serum, I think that the cost would be no more. Since Dr. Karelitz has been doing this work, I have been doing some calculations, and I think the cost of equivalent amounts, or equivalent potencies, of the pooled immune adult serum, of which, of course, an unlimited amount could be produced, and of the globulin extract of immune serum would be the same.

HEMOGLOBIN DIFFERENCES IN HEALTHY WHITE AND NEGRO INFANTS

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To our knowledge, no systematic statistical analysis has been made of the blood of sufficiently large numbers of healthy persons for detection of a racial difference expressed in hemoglobin values. Many investigators have studied the hemoglobin content of the human blood, and in the main statistics submitted have tended toward the establishment of standards for given ages or toward showing the effect of certain nutritive elements on the hemoglobin. In some studies of growth conducted in the Research Laboratory of the Children's Fund of Michigan, where monthy observations on the blood were made as part of the detailed examination given each of 364 healthy infants, there was a sufficiently large number of Negro infants to furnish some valuable hemoglobin comparisons hitherto unreported.

Some of the more elaborate investigations presented in the literature, such as Magnusson's study of the hemoglobin level of premature infants [1] and Mackay's comprehensive study of nutritional anemia in infants,[2] were designed primarily for rather restricted observations. Yet, in addition to answering questions on the specific problems, the

From the Research Laboratory of the Children's Fund of Michigan and the Children's Hospital of Michigan, Detroit, and the Department of Mathematics of the University of Michigan.

1. Magnusson, J. H.: Zur Kenntnis der Blutveränderungen bei Frühgeborenen, Acta pædiat. (supp.) **18**:1, 1935.

2. Mackay, H. M. M.: Nutritional Anaemia in Infancy, Medical Research Council, Special Report Series, no. 157, London, His Majesty's Stationery Office, 1931.

studies made a large contribution to the knowledge of such general topics as the variation in the hemoglobin content of the blood, the lack of any significant sex differences and the absence of any marked variation due to minor infections. In regard to the relative merits of the several different methods used in determining the hemoglobin content,[3] there seem to be honest differences of opinion. A comparison of results, however, shows consistent agreement as to the relative values of the hemoglobin content of the blood at different age levels.[4] Our investigations verified these general results, and in addition, since 92 of the 364 infants studied were Negroes, contributed some valuable racial comparisons of the hemoglobin levels of white and Negro children.

The subjects of this study were known to be average healthy infants, as judged from continuous and intensive clinical observations by two pediatricians (B. M. H. and M. W. P.). They were carefully selected from cooperative patients of the indigent and semi-indigent classes and were furnished with specific foods in accordance with average pediatric practice. Supervised nursing service was given in their homes. All received good care in the home and grew as well as, or better than, the infants in the first year of life represented by the average growth curves found in the literature. In addition, the detailed monthly records of anthropometric measurements, roentgenograms, occurrence of illnesses, blood counts, determinations of hemoglobin and the like gave convincing evidence of satisfactory development.[5] Specific changes were made in the basal diet to meet the changing needs for growth. These dietary changes could not have been responsible for the hemoglobin differences observed in this racial study. The basal diet (composed of evaporated milk modified with corn syrup, powdered lemon juice of known vitamin C concentration[6] and vitamin D given either in irradiated milk or in cod liver oil, each of known potency) was supplemented with cereals, vegetables, etc., during the time that the lower average hemoglobin values appeared.

The taking of blood was uniform as to time of day and procedure. The determinations of hemoglobin and the red blood cell counts were standardized as will be outlined.

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3. Osgood, E. E.: Hemoglobin, Color Index, Saturation Index and Volume Index Standards, Arch. Int. Med. **37**:685 (May) 1926. Haden, R. L.: Hemoglobin Standards, Am. J. Clin. Path. **3**:85, 1933.

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5. Poole, M. W.; Hamil, B. M.; Cooley, T. B., and Macy, I. G.: The Stabilizing Effect of Increased Vitamin B (B_1) Intake upon the Growth and Nutrition of Infants, Am. J. Dis. Child. **54**:726 (Oct.) 1937. Colby, M. G.; Macy, I. G.; Poole, M. W.; Hamil, B. M., and Cooley, T. B.: Relation of Increased Vitamin B Intake to Mental and Physical Growth of Infants, ibid. **54**:750 (Oct.) 1937. Poole, M. W.; Hamil, B. M.; Cooley, T. B., and Macy, I. G.: The Addition of Vegetable Soup and Pureed Vegetables to the Diet of Artificially Fed Infants, ibid., to be published.

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A freely flowing source of blood was established in the large toe by a Bard-Parker knife, no. 11. The same Trenner hemoglobin and red blood cell pipets, certified by the United States Bureau of Standards, were used throughout the study. The blood for the determination of hemoglobin was prepared in a 1:100 dilution in the 10 cu. mm. diluting pipet with tenth-normal hydrochloric acid. The pipet was shaken immediately for two or three seconds and allowed to stand thirty minutes at room temperature in order that the color reaction might take place in the bulb of the pipet. The hemoglobin was then determined in the Haden-Hausser hemoglobinometer,[7] the result being checked at regular intervals against results obtained by the Van Slyke gasometric method, for estimating hemoglobin.[8] In order that personal error might be minimized, all observations were made by only 3 laboratory workers (B. M., L. E. and M. L. S.).

Although it is recognized that the red cell count is less accurate than the determination of hemoglobin, because of a greater chance of

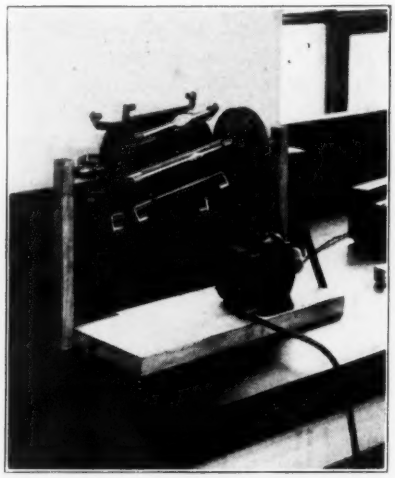

Fig. 1.—The mechanical angular-rotary shaker.

error, the results of red cell counts for these infants are included here for comparative purposes.

Hayem's diluting solution was used for making the erythrocyte counts. A mechanical angular-rotary shaker was used for shaking the pipet of the hemacytometer; after ten minutes of mixing a uniform distribution of cells was obtained (see illustration). One Levy-Hausser counting chamber certified

7. Haden, R. L.: A New Hemoglobinometer, J. Lab. & Clin. Med. **18**:1062, 1932-1933.

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by the United States Bureau of Standards was utilized throughout the study. This was divided by the improved Neubauer ruling into units 0.0025 mm. square and 0.1 mm. deep. Especial care was taken to keep the counting chamber scrupulously clean, to discard 3 or 4 drops from the blood pipet before the counting chamber was filled, to fill the chamber as carefully and as quickly as possible and to allow two or three minutes for the settling of the cells before the red cell count was made. All the spaces beneath the 5 double rulings were counted, the area used being 0.2 sq. mm. in all. The sum of the erythrocytes in these squares was multiplied by 10,000, the results being the number of cells per cubic millimeter.

TABLE 1.—*The Hemoglobin of Two Hundred and Seventy-Two White and Ninety-Two Negro Infants*

	Age in Days	N	M	σ	σ_M	a_3
White	14—	125	13.24	1.98	0.18	—0.4
	42—	206	11.13	1.35	0.09	—0.3
	70—	243	10.91	0.95	0.06	+0.1
	98—	250	11.38	0.95	0.06	—0.1
	126—	225	11.78	0.95	0.06	—0.5
	154—	224	11.85	0.95	0.06	—0.6
	182—	215	11.63	0.85	0.06	—0.2
	210—	202	11.44	0.90	0.06	—0.4
	238—	181	11.36	1.06	0.08	—0.2
	266—	191	11.27	0.99	0.07	—0.1
	294—	191	11.24	1.10	0.08	+0.1
	322—	156	11.17	0.97	0.08	—0.4
	350—	143	11.20	1.03	0.09	—0.5
	378	11	10.77	0.78	0.25	—0.3
Negro	14—	43	13.59	1.70	0.26	—0.3
	42—	66	11.29	1.25	0.15	—0.5
	70—	86	10.99	1.15	0.12	+0.3
	98—	82	11.15	1.03	0.11	
	126—	83	11.10	1.18	0.13	—0.1
	154—	88	11.14	1.07	0.11	—0.2
	182—	76	10.89	1.12	0.13	—0.4
	210—	71	10.82	1.15	0.14	—0.1
	238—	65	10.75	1.33	0.17	—0.2
	266—	72	10.81	1.22	0.14	—0.6
	294—	62	10.35	1.43	0.18	—0.4
	322—	54	10.44	1.39	0.19	—0.2
	350—	55	10.43	1.20	0.16	—0.5
	378	3	10.5	1.47	1.04	

N, indicates number of hemoglobin determinations; M, average; σ, standard deviation; σ_M, standard deviation of means; a_3, measure of symmetry.

Presented in table 1 are some results from a study of 3,469 samples of blood, of which 2,563 were taken from white infants and 906 were taken from Negro infants kept on standardized dietaries. The calculations were based on the number of grams of hemoglobin, $\overline{g}$, per hundred cubic centimeters of blood ($\overline{g}$ denoting the variation of a measurement from the average). The number of measurements, N, the value of the average, $M = \frac{\Sigma g}{N}$, the measure of variation, $\sigma = \sqrt{\frac{\Sigma \overline{g}^2}{N}}$, the standard error of the mean, $\sigma_M = \frac{\sigma}{\sqrt{N-1}}$ and a measure of the asymmetry of the data about their mean, $a_3 = \frac{\Sigma \overline{g}^3}{N\sigma^3}$, are given for the respective racial groups at age intervals of four weeks, the first age interval being from 14 to 42 days and the last one being from 350 to

378 days. The consecutive averages are pictured in figure 2 in order that the results may be more readily followed.

Two things stand out in the graphic presentation, namely, the small differences in the hemoglobin averages of the two races during the first three months (each of twenty-eight days) and the wide divergence of the respective averages throughout the remaining months of the year. We should like to know if these differences are significant.

A graphic presentation, although often informative, rarely gives an accurate measure of the particular characteristic under consideration. If we accept as a significant difference between two averages, $M_w - M_n$ (M_w and M_n being the hemoglobin averages for the white and for the Negro infants, respectively), one which is equal to or greater than

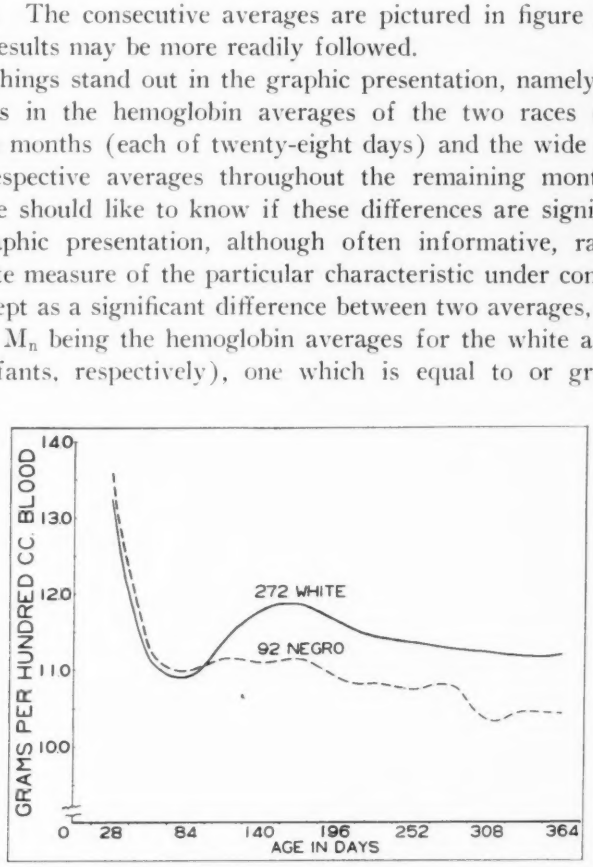

Fig. 2.—Differences found in the average values of hemoglobin, measured in grams per hundred cubic centimeters of blood, in healthy white and Negro infants.

twice the standard deviation of this difference, that is, $|M_w - M_n| \geq 2\sigma_{(M_w - M_n)} = 2\sqrt{(\sigma_{M_w})^2 + (\sigma_{M_n})^2}$ then we have a precise measure for this variation. Shown in table 2 are the values of $M_w - M_n$ for the periods designated and the corresponding standard deviation of these differences. Even without further numerical calculation it is evident that these differences are insignificant during the first three months and distinctly significant during the remainder of the period of this study, the hemoglobin level of the Negro children being much the lower of the two.

There is another significant difference between the hemoglobin measurements of the two racial groups, one which is not apparent from the graphic portrayal of the averages. The variation of the data for the respective racial groups as measured by the standard deviation, σ,

was found to be much greater for the Negro infants for that period of the study during which the average was significantly lower than that of the white infants. These facts are presented in table 3. The symbols σ_w and σ_n denote the standard deviations of the measurements of the white and of the Negro infants, respectively, and the formula $\sigma_{\sigma_w - \sigma_n} = \sqrt{\frac{\sigma_w^2}{2N_1} + \frac{\sigma_n^2}{2N_2}}$ represents the standard deviation of the difference of these two measures of variation. In each of the divisions shown in the table we find $|\sigma_w - \sigma_n| > 2\,\sigma_{\sigma_w - \sigma_n}$, which we accept as significant variation.

TABLE 2.—*Differences in Racial Averages of Hemoglobin*

Age Interval	Race	Number of Hemoglobin Determinations	Average (M)	Standard Deviation of the Mean	Difference Between White and Negro Averages	Standard Deviation of Difference of Means
1-3 months	White	574	11.49	0.07	0.17	0.14
1-3 months	Negro	195	11.66	0.12		
4-14 months	White	1,989	11.45	0.02	0.62	0.05
4-14 months	Negro	711	10.83	0.05		

TABLE 3.—*The Measurement of Variations in Hemoglobin Content*

Age Interval	Race	Number of Hemoglobin Determinations	Standard Deviation of Measurements	Standard Deviation of Standard Deviation of Measurements	Difference Between Standard Deviations of Measurements of White and Negro Infants	Standard Deviation of Differences
1-3 months	White	574	1.66	0.05	0.02	0.10
1-3 months	Negro	195	1.68	0.09		
4-14 months	White	1,989	1.00	0.02	0.22	0.03
4-14 months	Negro	711	1.22	0.03		

The above results were confirmed, in large part, by a nine month study on an additional group of 63 white and 54 Negro infants. This study[9] was carried on primarily to determine the effect of viosterol on the blood and on the general growth of infants; but the data, though for only a small group, are valuable to us in confirming some of the results of the study of the larger group. The smallness of the total frequency in each age group is reflected in the large standard errors of the respective averages and likewise in the large standard errors of the measures of variation σ_o (roughly, $0.7\,\sigma_n$). However, in this much smaller group, which was studied for a shorter period, the racial difference in the

9. Martha Eliot, Donald J. Barnes and Florence Browne of the United States Children's Bureau permitted us to make studies on the blood of this group of infants.

TABLE 4.—*The Hemoglobin of Sixty-Three White and Fifty-Four Negro Infants*

Age in Days	White				Negro			
	N	M	σ	σ_M	N	M	σ	σ_M
14—	32	13.50	1.64	0.29	15	13.10	1.34	0.36
42—	27	11.06	1.34	0.26	22	11.07	1.03	0.22
70—	41	11.02	1.19	0.19	43	11.12	1.03	0.17
98—	40	11.16	0.92	0.15	40	10.98	1.00	0.16
126—	45	11.47	1.06	0.15	37	11.35	0.97	0.16
154—	47	11.65	1.10	0.16	38	11.16	0.93	0.15
182—	29	11.36	0.91	0.17	29	11.02	1.22	0.23
210—	14	11.25	0.77	0.21	9	10.39	1.41	0.50
238—	5	10.40	0.49	0.25	6	10.58	0.84	0.37

TABLE 5.—*The Red Blood Cells of Two Hundred and Seventy-Two White and Ninety-Two Negro Infants*

	Age in Days	N	M	σ	σ_M	a_3
White	14—	124	434.63	77.81	7.02	
	42—	204	375.69	50.55	3.55	
	70—	241	386.29	40.39	2.61	
	98—	247	421.47	50.17	3.20	
	126—	225	448.35	49.11	3.28	
	154—	223	470.83	54.92	3.94	
	182—	213	468.88	47.07	3.23	
	210—	200	470.17	48.47	3.44	
	238—	180	476.97	52.73	3.94	
	266—	190	481.64	53.37	3.89	
	294—	190	485.45	49.11	3.58	
	322—	156	483.07	52.77	4.24	
	350—	142	474.27	64.19	5.41	
	378—	7	478.57	46.07	18.81	
Negro	14—	43	465.77	67.31	10.39	
	42—	66	400.18	62.09	7.70	
	70—	86	401.69	58.13	6.23	
	98—	82	440.74	59.78	6.64	
	126—	83	464.30	51.99	5.74	
	154—	87	467.68	52.98	5.71	
	182—	76	466.78	53.77	6.21	
	210—	71	471.60	47.08	5.63	
	238—	65	470.11	51.97	6.50	
	266—	72	485.11	55.02	6.53	
	294—	61	477.54	48.96	6.32	
	322—	54	489.07	56.82	7.88	
	350—	54	477.37	51.83	7.19	
	378—	4	443.00	31.58	18.23	
Total	14—	167	442.65	74.67	5.94	—0.1
	42—	270	381.67	54.63	3.33	0.3
	70—	327	390.34	46.23	2.56	0.4
	98—	329	426.27	53.39	2.95	0.5
	126—	308	452.65	50.30	2.87	0.2
	154—	310	469.94	54.40	3.09	0.2
	182—	289	468.33	48.93	2.88	0.3
	210—	271	470.55	48.50	2.95	0.1
	238—	245	475.15	52.61	3.37	0.4
	266—	262	482.60	53.85	3.33	0.2
	294—	251	483.53	49.19	3.11	0.1
	322—	210	484.61	53.90	3.70	0.6
	350—	196	475.12	61.05	4.37	0.1
	378—	11	465.64	44.86	14.17	0.4

N, number of red blood cell determinations; M, average; σ, standard deviation; σ_M, standard deviation of means; a_3, measure of symmetry.

hemoglobin average after the third month is shown, as definitely as in the longer study, by the data presented in table 4.

The red cell count does not necessarily follow the estimated hemoglobin content. A detailed study failed to establish any significant difference between the red blood cell count of the white infants and that of the Negro infants, but the separate results are of interest and are presented here with data on the combined group.

SUMMARY

A total of 3,988 studies of the blood were made on 481 healthy infants during their first year of life, 2,843 studies being made on 335 white babies and 1,145 studies on 140 Negro babies, an average of 8.4 and 8.2 determinations, respectively, for each white and each Negro child.

The average values of hemoglobin for the white infants were from 0.5 to 1 Gm. (per hundred cubic centimeters of blood) higher after the fourth month than those for the Negro infants during the remainder of the first year of life. However, no racial differences were observed in the hemoglobin curves for the two groups during the initial drop and up to the end of the third month.

Hemoglobin measurements for the Negro infants were characterized by significantly greater variation than those for the white infants during the period in which the average for the Negro babies was distinctly lower.

Despite the higher hemoglobin values for the white infants, detailed study failed to establish any significant racial difference between the red blood cell values of the white infants and those of the Negro infants.

This racial difference should be considered when clinical results concerning hemoglobin averages are interpreted from the standpoint of influencing factors.

Further consideration will be given to other influencing factors peculiar to the Negro race as contrasted to the apparent physiologic characteristics of the blood picture of Negro infants described in this preliminary report.

The expense of this study was in part defrayed by the Gerber Products Company, Fremont, Mich., and by the Borden Company, New York.

Case Reports

XERODERMA PIGMENTOSUM WITH MENTAL DEFICIENCY

A REPORT OF TWO CASES

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NEW YORK

Xeroderma pigmentosum is a comparatively rare disease which was first described by Kaposi.[1] It is of unknown etiology and probably congenital in origin. Consanguinity of the parents is said to be a predisposing factor. The onset of the disease occurs characteristically during the first year of life. The skin is apparently hypersensitive to light rays of wavelengths between 280 and 310 millimicrons.[2] The pathologic condition of the skin shows three stages:[3] (1) erythroderma, with mottling and hyperemia, slight puffiness and roughening, (2) pigmentation, with freckle formation, scaling and the formation of transient flat warts, and (3) the appearance of nonmetastasizing epitheliomas, cutaneous atrophy and late contractures of the eyelids, nose and mouth. The course is progressive but usually shows periods of quiescence. The duration of life is, as a rule, not beyond twenty-one years. Death generally results from inanition.

Most of the cases of this condition have been reported by dermatologists. Mental apathy has been described in some of these cases. Adams[4] reported a "dull habit of mind" in his patient, a 19 year old girl. White[5] described an undersized girl of 11 years but said nothing of her mental state. Canright's[6] Chinese patient, a boy of 6 years, was "apathetic." Among Councilman and Magrath's[7] patients, one girl of 12 years was said to have mental impairment but could answer

From the Dr. Abraham Jacobi Division for Children, Lenox Hill Hospital, service of Dr. Jerome S. Leopold.

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questions intelligently. White [5] reported on a 17 year old boy whose physical development was that of a child of 12 years but whose mentality was said to be normal. Corlett's [8] patient had had "contractures of the joints from birth," but no mention was made of the mental state. Copeland and Martin [9] described an Italian girl of 9 years who was "not primarily a mental defective" but who was "backward" owing to "deprivation of experience." These authors stated that many children with xeroderma pigmentosum, while not mentally retarded, may appear so because poor eyesight has deprived them of an adequate education. On the other hand, most of the patients [10] reported on, including two studied by a pediatrician (Rotch), have been mentally normal or so nearly normal as to have provoked no comment by the authors of the reports. Furthermore, in none of the standard textbooks of dermatology,[11] with the exception of the one by MacLeod,[12] is any mention made of mental deficiency as a part of the clinical picture of xeroderma pigmentosum.

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(Footnotes continued on next page)

A review of the literature has disclosed only three reports in which xeroderma pigmentosum has been associated with idiocy or marked mental deficiency. Among Klein's [13] patients was a boy of 19 who was stated to have an infantile mentality. He was the offspring of a mother who was mentally inferior and of a father who was an alcoholic addict. Belisario's [14] patients (a girl of 14 years and her 8 year old brother, in both of whom contracture of the left wrist was present) were placed in a "low mental category" by a psychiatrist. No statement as to their heredity was made; in both patients the Wassermann and Kline reactions of the blood were negative. De Sanctis and Cacchione [15] described their patients as xerodermatic idiots. These three brothers, offspring of apparently healthy first cousins, were undersized and had undescended or small testes. The Wassermann reaction of the blood in each case was negative; in one case the Wassermann test of the spinal fluid gave a 1 plus reaction. Postmortem examination of the oldest child revealed that the brain was small, the outstanding changes consisting of an increased amount of neuroglia in the outer layers and atrophy of the pyramidal cells of the cortex of the frontal and temporal lobes. De Sanctis and Cacchione [15] pointed out the similarity in the senile type of tissue changes in both skin and brain and suggested that there might be in these cases a congenital defect of the ectodermal tissue.

The two patients [16] to be presented here exhibited xeroderma pigmentosum, mental deficiency, abnormality of speech and gait and a

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15. de Sanctis, C., and Cacchione, A.: L'idiozia xerodermica, Riv. sper. di freniat. **56**:269, 1932.

16. These two children were presented as showing xeroderma pigmentosum before the Manhattan Dermatological Society, March 10, 1931, by Dr. L. Oulmann, of the Lenox Hill Dermatologic Clinic.

moderate degree of somatic underdevelopment. They differed from the patients described by de Sanctis and Cacchione in that the genital glands were apparently normal and the physical underdevelopment was not so marked.

REPORT OF CASES

CASE 1.—G. B. was a 13 year old American boy.

Family History.—The mother, an American of Irish parentage, was 31 years old. Her mentality appeared normal. The father, an American of German parentage, was 34 years old. He appeared normal mentally. There was no consanguinity, and no history of syphilis or of mental or cutaneous diseases was obtained. There were two children (cases 1 and 2) in the family. There was no history of a miscarriage; contraception had been practiced since the birth of the second child.

Fig. 1 (case 1).—G. B., aged 13 years.

Personal History.—Birth was normal, at full term. The child held his head up at 4 months, walked at 13 months and spoke single words before he was 2 years old. Speech was never perfect, being slurred and explosive. There were no convulsions or any acute illness suggestive of encephalitis. The gait had always been awkward. The child went to school when 6 years old. He reached grade 3A and was placed in an ungraded class when 9 years old. He never did well in school. He was always underweight and nervous. Redness and dryness of the skin and hypersensitivity to sunlight were noted before he was 1 year old; this was thought at first to be due to infantile eczema. Pigmentation was present by the time he was 2 years old. The child has been seen at various times in the dermatologic clinics of the Lenox Hill, New York and Presbyterian hospitals.

He was admitted to the Lenox Hill Hospital on Nov. 5, 1936, with a history suggestive of acute nephritis three weeks before and of albuminuria at the time of the visit to the clinic.

Examination.—The patient was a poorly nourished, underdeveloped, somewhat apprehensive boy of 13 years who was not acutely ill. The temperature was 99.6 F.; the pulse rate, 100, and the respiratory rate, 18. The blood pressure was 112 systolic and 78 diastolic. He was 56 inches (142.2 cm.) tall and weighed 61 pounds (27.7 Kg.), being 16 pounds (7.3 Kg.) below the standard weight for his height.

Measurement of the skull showed: circumference, 19.5 inches (49.5 cm.); transverse diameter, 5.3 inches (13.5 cm.); longitudinal diameter, 6.7 inches (17 cm.); cephalic index, 79, and span, 59 inches (149.9 cm.).

Examination of the skin (by Dr. L. Spiegel) revealed hyperpigmentation of the exposed parts, especially of the face and neck, with freckles and pigmented moles. On the nose there were depigmented scaly areas due to superficial ulceration, areas of eczematization and a few small telangiectases, with some scarring. The findings were typical of xeroderma pigmentosum.

The boy used glasses for reading. Slight photophobia and conjunctival hyperemia were present. Hearing was normal. The tonsils were hypertrophied and infected.

Examination of the heart, lungs, abdomen and genitalia revealed no abnormality.

Neurologic examination showed that the gait was spastic, with absence of associated movements of the arms. No ataxia was present. All the deep reflexes were diminished, with absence of the knee and ankle jerks. No gross sensory changes or abnormal reflexes were noted. The general muscular coordination was poor. Speech was explosive and ataxic, with some slurring. The optic fundi were normal. There was no pigmentation of the retina. The neurologic consultant considered the signs indicative of a degenerative lesion of the central nervous system (unclassified).

Psychometric study showed that the boy was cooperative. Speech perception was distorted in response to both visual and auditory stimuli, e. g., "gown" was defined as "a little man" (clown); "ship," as "water with carrots and peas" (soup); "puddle," as "a little stone with the goldfish" (pebble). The mental age was estimated as follows: (1) Stanford-Binet test, 7 to 8 years; (2) Porteus mazes, 4 to 6 years, and (3) Goodenough drawing, 3 to 5 years. The interpretation of these studies was that the boy was feebleminded.

Laboratory Data.—The blood count showed: erythrocytes, 4,960,000; hemoglobin, 14 Gm.; leukocytes, 9,250; polymorphonuclears, 64 per cent, with 10 per cent stab cells; lymphocytes, 30 per cent; eosinophils, 4 per cent, and mononuclears, 2 per cent.

Chemical analysis of the blood showed: urea, 11.8 mg.; creatinine, 0.5 mg.; uric acid, 2.8 mg.; sugar (during fasting), 86 mg.; cholesterol, 200 mg.; calcium, 10.8 mg.; phosphorus, 4.4 mg.; magnesium, 3.4 mg., and sodium, 327 mg., per hundred cubic centimeters. The carbon dioxide-combining power was 41 volumes per cent.

The Wassermann and Kline reactions of the blood were negative.

Examination of the spinal fluid revealed: cells, 5 per cubic millimeter; chloride, 118 mg.; sugar, 54 mg., and protein, 23 mg., per hundred cubic centimeters. The Wassermann reaction was negative.

The urine showed: hematoporphyrin, 0; albumin, 1 plus, and erythrocytes, 0.

The basal metabolic rate was minus 23 per cent (on two occasions).

Roentgenograms revealed that the sella turcica was small and that the carpal centers, heart and lungs were normal.

Course.—The course was uneventful. The urine was free from albumin in one week. The child was discharged on December 2 to the outpatient department.

Follow-Up Study.—Dried whole thyroid, 3 grains (0.2 Gm.) daily, was administered, and the basal metabolic rate was minus 15 per cent, and the cholesterol content of the blood was 184 mg. per hundred cubic centimeters in April 1937. The patient had gained 8 pounds (3.6 Kg.). The condition of the skin was unchanged.

CASE 2.—A. B., aged 12 years, was the brother of G. B. (case 1).

Personal History.—The history was almost identical with that of the first patient. The abnormality of the skin was noted when the patient was 5 or 6 months old. He was in the same ungraded class in school as his brother.

Fig. 2 (case 2).—A. B., aged 12 years.

Examination.—The child was admitted to the Lenox Hill Hospital on Feb. 11, 1937. He was a poorly nourished, underdeveloped boy of 12 years. He was extremely apprehensive and uncooperative. The temperature was 98 F.; the pulse rate, 96, and the respiratory rate, 15. The blood pressure was 120 systolic and 90 diastolic. The boy was 55 inches (139.7 cm.) tall and weighed 58 pounds (26.5 Kg.), being 14 pounds (6.4 Kg.) below the standard weight for his height.

Measurement of the skull showed: circumference, 19.6 inches (49.8 cm.); transverse diameter, 5.7 inches (13.5 cm.); longitudinal diameter, 6.5 inches (16.5 cm.); cephalic index, 82, and span, 54 inches (137.2 cm.).

Examination of the skin (by Dr. L. Spiegel) revealed numerous pigmented areas the size of a split pea over the face, with some scarring. There were superficial ulcerations on the nose, with scabs and crusts. The findings were typical of xeroderma pigmentosum.

Examination of the heart, lungs, abdomen, genitalia, eyes, ears, nose and throat revealed no abnormality.

Neurologic examination showed that the gait was awkward and slightly spastic, with absence of associated movements of the arms. All the deep reflexes were diminished. There were no abnormal reflexes. Speech was explosive, with some slurring. The optic fundi were normal.

Psychometric study was attempted, but the boy was apprehensive and uncooperative. He answered simple questions, but would not cooperate sufficiently for the making of psychometric tests. His general intelligence was about the same as his brother's.

Laboratory Data.—The blood count showed: erythrocytes, 4,500,000; hemoglobin, 9.2 Gm.; leukocytes, 13,000; polymorphonuclears, 72 per cent, with 6 per cent stab cells, and lymphocytes, 28 per cent.

Chemical analysis of the blood showed: urea, 12.5 mg.; creatinine, 0.5 mg.; uric acid, 3.8 mg.; sugar (during fasting), 96 mg., and cholesterol, 228 mg., per hundred cubic centimeters. The carbon dioxide-combining power of the blood was 49 volumes per cent. The dextrose tolerance test gave a normal result.

The Wassermann and Kline reactions of the blood were negative.

The urine showed no hematoporphyrin.

The Wassermann and Kline reactions of the spinal fluid were negative.

Roentgenograms revealed that the sella turcica was infantile, that the carpal centers were normal for a child of 10 years and that increased markings were present in the region of the hilus of the right lung.

The basal metabolic rate could not be determined because of the boy's lack of cooperation.

Follow-Up Study.—At present the boy is being given dried whole thyroid, 1½ grains (0.1 Gm.) daily. The cholesterol content of the blood has not yet been checked. He has gained 4 pounds (1.8 Kg.).

COMMENT

These two boys present the classic picture of xeroderma pigmentosum. The disease has progressed more rapidly in the younger boy, and it seems likely that epitheliomas will appear at the site of the ulcerations on the nose. The mental deficiency in both boys may be a pure coincidence. However, the presence of the peculiar gait and the speech abnormality in both boys forces one to consider the possibility of degeneration of the central nervous system. The hypothesis offered by de Sanctis and Cacchione [15] of a congenital defect in the ectodermal system resulting in premature senility of skin and nervous tissue is attractive. It does not explain the apparent thyroid deficiency, as indicated by the lowered basal metabolic rate (case 1) and the slight delay in ossification of the carpal centers (case 2). Because these boys were not examined by a psychiatrist in early childhood, it is not known whether there has been mental arrest, mental regression or mental deficiency since birth. The history, if accurate, seems to indicate that mental arrest was noted about the sixth or seventh year of life; some regression may now be taking place in the older boy, who is apathetic.

More could be learned of the mental aspects of xeroderma pigmentosum if these unfortunate children were seen and followed carefully by the pediatrician and psychiatrist as well as by the dermatologist. If this were done it would be possible to determine how often a true mental defect is associated with this condition and whether or not it is congenital in origin, or whether the mental retardation is only apparent and is secondary to environmental factors, as has been suggested by some authors.

SUMMARY

Two cases of xeroderma pigmentosum in brothers are reported.

Associated with lesions of the skin were abnormalities of the speech and gait and marked mental deficiency.

Hypothyroidism was suggested by the lowered basal metabolic rate and the slight delay in ossification of the carpal centers.

The possibility of degeneration of the central nervous system analogous to the degenerative lesions of the skin is suggested.

ADENOMA OF THE LIVER

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The discovery of a tumor within the abdominal cavity of an infant presents an interesting problem for clinical diagnosis. Primary tumor of the liver in infancy is not particularly infrequent, but benign adenoma of the liver in childhood is of sufficient rarity to prompt the report of this case. A tumor of this type is of more interest histologically than clinically. The structual nature of the tumor cell, as well as of the arrangement of the tumor tissue, may not simplify the recognition and classification of the neoplastic alterations. Epstein,[1] in summarizing 1,000 consecutive autopsies on children and infants, recorded no adenoma of the liver. Shaw [2] reported a case of hepatoma of the right lobe in a child 13 years of age. The tumor, measuring 15.5 by 12 cm. and weighing 2 pounds and 3 ounces (992 Gm.), was situated so as to permit surgical removal. The patient was alive and well twenty months after the operation. Turner [3] described a successful operation for hepatic adenoma. Johnson [4] removed a most unusually situated tumor of the liver from a child 11 years of age. The neoplasm was found projecting from the inferior surface of the liver. The patient was reported well thirteen years later. The fact that hepatic tumor may be relieved by surgical intervention adds weight to the clinical study of these neoplasms. Castle [5] successfully removed a pedunculated tumor from the under-surface of the liver of a 10½ month old baby. Death occurred fourteen days later, accompanied with symptoms of acute gastro-enteritis.

REPORT OF A CASE

The family history gave no evidence of syphilis or tuberculosis. The baby was born at full term; the delivery was normal, and the weight at birth was 7 pounds (3,175 Gm.). The baby nursed for two months and then was put on a modified cow's milk formula. He sat up at 7 months of age. There had been no previous illnesses.

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1. Epstein, I. M.: Causes of Death and Incidence of Disease in Children, Am. J. Dis. Child. **41**:1363 (June) 1931.
2. Shaw, A. F. B.: J. Path. & Bact. **26**:475 (Oct.) 1923.
3. Turner, G. G.: Proc. Roy. Soc. Med. (Sect Surg.) **16**:43 (June) 1923.
4. Johnson, E. W.: Lancet **2**:19 (July 5) 1924.
5. Castle, O. L.: Surg., Gynec. & Obst. **18**:477, 1914.

The present illness was manifested by gradual onset of anorexia and loss of weight. There were marked irritability and fussiness. There was no vomiting or diarrhea. Marked jaundice was not present. For the previous two weeks there had been an unusual prominence in the upper right quadrant of the abdomen, which increased gradually. During the three days prior to admission the baby had not voided.

Physical examination showed a well developed and well nourished child 8 months of age. The scleras were not deeply jaundiced. The heart was normal. The bases of both lungs presented rather coarse breath sounds. There was no jaundice of the skin. There were no enlarged superficial lymph nodes. There was no edema of the lower extremities. The abdomen was markedly prominent and was dull to percussion along the flanks. The right upper quadrant presented an easily palpable mass.

Fig. 1.—Photograph of the tumor within the liver (gross specimen).

Laboratory examinations gave essentially negative results. Roentgenograms of the abdomen and the pelvis showed a large mass of soft tissue occupying almost the entire abdomen. The outline of the lower pole of the right kidney was visible. The kidney was low and apparently enlarged. The intestinal loops were displaced downward and to the right. It was not clear whether the tumor was related to the upper pole of the right kidney.

The course in the hospital was rapid. The morning after admission, the baby's condition rapidly changed for the worse. There were marked pallor, rapid pulse and signs of shock. Immediate operation was advised and performed. At operation the opening of the peritoneal cavity permitted the escape of a large amount of bloody fluid containing numerous clots of blood. A tumor the size of a small grapefruit was found to arise from the under-surface of the liver and extend to the outer side of the gallbladder, which was flattened and spread out on the

medial aspect of the tumor nodule. The tumor was vascular and had large, dilated veins coursing over the periphery. One of these large blood vessels was bleeding freely into the peritoneal cavity. The tumor was inoperable, and attempts to halt the hemorrhage with sutures were ineffective because of the extreme friability of the tumor capsule. The baby was returned to the ward in poor condition and died the same evening.

Autopsy showed the body to be that of a well developed and well nourished white male infant. It was 66 cm. long. The abdomen was moderately distended. There was no jaundice or edema of the lower extremities. The peritoneal cavity contained three dark red masses of clotted blood. There was no free blood or

Fig. 2.—Low power photomicrograph showing uniform adenomatous design.

evidence of peritonitis. A tumor about the size of a large orange was found projecting downward from the right lobe of the liver. Its origin was in the liver. The intestines were displaced downward by the new growth. Several large blood vessels were seen on the surface of the tumor. Along the course of one of the larger vessels was a point of rupture of the wall of the vessel with adjacent hemorrhage. The mesenteric lymph nodes were moderately enlarged, firm and grayish white.

A large tumor occupied a considerable portion of the right lobe of the liver. This was roughly spherical and measured about 10 cm. in diameter. About one half of the tumor was buried in the substance of the liver. Its external surface was grayish pink. The capsule of the liver and the peritoneum apparently con-

tinued unbroken over the surface of the tumor. The new growth was distinctly softer than the hepatic tissue. The cut surface of the neoplasm was grayish pink, finely granular, homogeneous, soft and limited at the periphery by a sharply demarcated fibrous capsule, which was adherent to the adjacent hepatic parenchyma. The tumor tissue was not broken up by intercurrent fibrous trabeculae, and no such trabeculae invaded the tumor nodule from the peripheral fibrous capsule. There was no cavity formation by necrosis. There was no obstruction to the flow of bile.

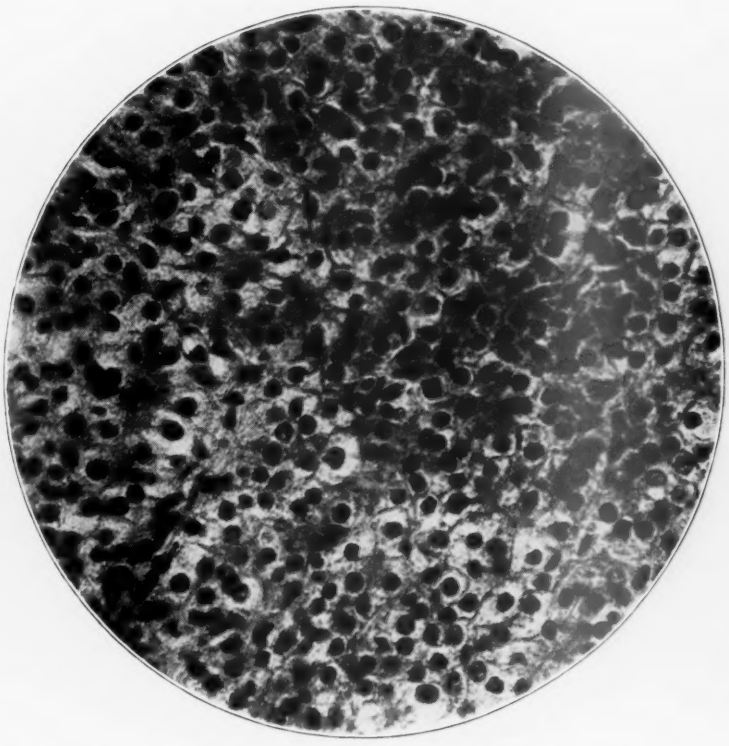

Fig. 3.—High power photomicrograph showing type of cell and uniform adenomatous design.

Microscopic examination showed the tumor tissue to be composed of cells about the size and shape of normal liver cord cells and to have sharp cuticular borders and an arrangement generally similar to that of normal hepatic tissue. However, there was no suggestion of lobule. The cells were often gathered together with central lumens. These glandlike structures were probably bile ducts. No true bile duct structures or connective tissue zones suggesting portal areas were seen. There was a delicate framework composed of connective tissues, in which an occasional blood-filled capillary was observed. A few wide connective tissue septums containing large blood vessels were seen. The nuclei of the tumor cells stained deeply and resembled those of the liver cord cells. No mitotic figures were seen. The cytoplasm of the tumor cells was sometimes finely granular and light purple, suggesting that of normal liver cells. Many neoplastic cells were

markedly vacuolated, and stains for fat revealed the presence of fat, but not in an amount commensurate with the vacuolation. These vacuolated cells resembled adrenal cortex cells to some extent. The fat was not doubly refractive, as determined by plane polarized light. There were no evidences of an intercellular substance.

The tumor tissue was separated from the liver tissue by a wide fibrous capsule, in which a few groups of tumor cells or liver cells were imprisoned. There was no tendency of the tumor tissue to invade the capsule by direct extension. The adjoining hepatic tissue was unaltered, except for compression and some increase in connective tissue. There were no evidences of extension of metastases to the regional lymph nodes. The microscopic diagnosis was adenoma of the liver.

COMMENT

The symptoms of primary hepatic tumor are referable to the gastrointestinal tract. There are usually anemia, anorexia and cachexia. The enlarging, prominent abdomen suggests the easily palpable tumor. Obstruction of the bile ducts results in jaundice, whereas interference with the portal or the lymphatic circulation produces ascites. The differential diagnosis is concerned with mixed sarcoma of the kidney, lymphosarcoma, neuroblastoma sympatheticum, pyogenic abscess and tuberculosis.

The solitary hepatic adenoma in the gross is usually pearly gray, opaque and of homogeneous consistency. There may be additional yellow and green bile-stained areas.[6] The growth may vary from a small nodule to a tumor 8 inches (20 cm.) in diameter. The cut surface is smooth and level and does not bulge above the cut capsule. The capsule is sharply demarcated at the periphery, and its layers are easily separated from the tumor proper. Histologically the neoplasm is made up of cords, tubes or alveoli closely resembling the structure of the liver. The details may vary somewhat in different portions of the tumor, but for the most part the design is essentially identical with that of an adenomatous growth. The cytoplasm of the tumor cells uniformly is finely granular and acidophilic and contains lipoid material. There are no mitoses of the nuclear chromatin. The nuclear outlines and the sizes of the cells are rather uniform.

In this case the sections of the tumor tissue strongly resembled the picture of adenoma of the cortex of the kidney. Adrenal rests of the liver have been described. Metastases to the liver from displaced adrenal rests are usually multiple. The lipoid of a hepatic adenoma is chemically unlike that of the adrenal gland. The fatty cytoplasm of adrenal and renal tumor cells is composed chiefly of cholesterol esters, which are doubly refractive. Connective tissue stains did not show the presence of rosette formation of neuroblastoma. Nile blue stains

6. Ewing, J.: Neoplastic Diseases, ed. 1, Philadelphia, W. B. Saunders Company, 1919.

did not show an extensive fatty content within the cells. The lipoid material of this tumor was not doubly refractive. Little [7] has shown that tumor of the adrenal cortex is associated with marked complex symptoms of virilism in infancy.

SUMMARY

Because of the infrequent occurrence of the condition, a case of benign adenoma of the liver is reported.

In the odd case of hepatic tumor there may be a pedunculated structure, amenable to surgical treatment.

The clinical symptoms and the histologic details are discussed.

40 Main Street.

7. Little, A. A.: J. Pediat. **9**:62 (July) 1936.

LEAD POISONING ASSOCIATED WITH ACTIVE RICKETS

REPORT OF A CASE WITH ABSENCE OF LEAD LINES IN THE SKELETON

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The changes in the growing skeleton revealed by roentgen examination have proved to be among the most constant and useful diagnostic features of plumbism in infants and in young children since these lesions were first discovered by several American and Japanese observers [1] independently in 1929 and 1930. Kasahara and his associates [2] found lead lines in the tibias in all of seventy-eight Japanese infants who had lead meningo-encephalitis. In their large experience with lead poisoning in Boston, McKhann and Vogt [3] saw only one patient who failed to show the characteristic changes in the bones, and they reported that the lesions seen with the roentgen rays led to the discovery of lead poisoning in numerous cases in which there were minimal clinical symptoms. At the Babies' Hospital in New York,

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From the Department of Diseases of Children, Columbia University College of Physicians and Surgeons, and the Babies' Hospital.

1. (*a*) Park, E. A.: The Bone Lesions of Congenital Syphilis: The Correlation of the Roentgen and Pathologic Observations, read before the New York Academy of Medicine, Section on Pediatrics, Nov. 14, 1929; Am. J. Dis. Child. **39**: 905 (April) 1930. (*b*) Vogt, E. C.: A Roentgen Sign of Plumbism: The Lead Line in Growing Bones, Am. J. Roentgenol. **24**:550, 1930. (*c*) Caffey, J.: Clinical and Experimental Lead Poisoning: Some Roentgenologic and Anatomic Changes in Growing Bones, Radiology **17**:957, 1931. (*d*) Park, E. A.; Jackson, D., and Kajdi, L.: Shadows Produced by Lead in the X-Ray Pictures of the Growing Skeleton, Am. J. Dis. Child. **41**:485 (March) 1931. (*e*) Kasahara, M.: Roentgenological Diagnosis of Chronic Lead Poisoning in Infants with So-Called Meningitis, Jikken Iho **18**:146, 1931. (*f*) Koga: Changes in the Bones as Seen in X-Ray Films of Cases of Lead Meningitis, J. Pediat. (Tokyo), 1931, no. 378, p. 1571. (*g*) Sato: Roentgenological Picture of Bones in Lead Poisoning with Case Reports, J. Clin. Pediat. (Tokyo), 1931, no. 5, p. 839.

2. Kasahara, M.; Hiroshimo, H., and Tokuyama: Changes in the Bones in Lead Poisoning and in So-Called Meningitis in Infants, J. Pediat. (Tokyo), 1932, no. 391, p. 2288.

3. McKhann, C. F., and Vogt, E. C.: Lead Poisoning in Children, J. A. M. A. **101**:1131 (Oct. 7) 1933.

shadows indicative of lead poisoning were present in the skeletal roentgenograms of the first thirty patients younger than 5 years of age for whom it was possible to make a diagnosis of lead poisoning of any degree after the first recognition of the roentgen changes that accompany the condition. The reliance physicians have come to place on the roentgen diagnosis of plumbism is consequently well grounded, and I was surprised to encounter the patient whose case is reported here, who was shown to have both chronic lead poisoning and active rickets of long standing and who, nevertheless, failed to show lead zones at the ends of the bones.

REPORT OF CASE

E. J., a Negro girl 3 years and 4 months of age, 96 cm. in height and weighing 13 Kg., was first seen in the Vanderbilt Clinic on Oct. 15, 1936, complaining of a limp in the right leg of three months' duration. In addition, there had been a gradual change in behavior during the previous spring, which was characterized, according to the parents, by mental dulness, inactivity, refusal to play with other children, inattention and disobedience. During the six weeks preceding her first visit to the clinic she had repeated attacks of vomiting, and in this same period there were numerous involuntary passages of urine. These symptoms had all persisted since the onset of illness, and the limp and dragging of the right foot had increased during the last weeks before admission.

The familial, natal and neonatal histories were noncontributory. The growth, development and behavior were normal before the present illness.

She was fed at the breast during the first three months and afterward gained satisfactorily on a formula. Orange juice and cod liver oil were started at the third month and she always took both of these without difficulty. *The mother was certain that the patient had had 1 tablespoonful of cod liver oil daily since the third month of life.* The potency of the cod liver oil was not known. Her diet on an average day was described as follows: breakfast, orange juice, cereal with milk, and milk; lunch, potato, spinach, green peas and milk; dinner, vegetable soup, meat and milk. The appetite was always good but had been abnormal since the eruption of the first tooth (fifth month), when she formed the habit of "eating everything: paint, plaster, burned matches, cigar butts, dirt off the wall." She had been seen to stand for hours picking and eating from a hole in a plastered wall or eating paint from chairs and window-sills. At first the parents attempted to curb this abnormal appetite, but they were unsuccessful, and she continued the practice for approximately three years.

In the spring of 1936 the patient had whooping cough with an uncomplicated recovery, and in September 1936 her tonsils had been removed.

She had had no convulsions. Her vision and hearing appeared to be normal, and there had been no motor disability except the weakness in the right leg.

Physical Examination.—She was apathetic and uncooperative. Her gait was spastic, with some dragging of the right leg. The mucous membranes showed a moderate pallor. No lead line was detected in the gingival mucosa. There were no pathologic changes in the head, neck, thorax and abdomen. The deep reflexes were increased at the knees and at the ankles. Babinski's sign was not present and there was no ankle clonus.

In the roentgenograms of the long bones no changes were present which warranted a diagnosis of lead poisoning (see later description of roentgen findings).

Examination of the blood showed a concentration of 10.6 Gm. of hemoglobin per hundred cubic centimeters (62 per cent), and 4,200,000 erythrocytes and 9,700 leukocytes per cubic millimeter. Of the leukocytes, 47 per cent were polymorphonuclears, 44 per cent lymphocytes, and 9 per cent monocytes. There was basophilic stippling of 10,600 erythrocytes per cubic millimeter. Serologic reactions in the blood were negative for syphilis. The Mantoux test (0.1 mg.) was negative.

Because of the history of pica and because of the stippling of the red blood cells a provisional diagnosis of lead poisoning was made and the patient was given calcium lactate tablets (0.3 Gm.) twice daily for two weeks. She was then admitted to the hospital for more complete examination.

On her admission to the hospital, on October 29, considerable disturbance in both gait and station was demonstrated. She walked unsteadily on a wide base, falling to either side or backward. When she was given support the ataxic gait continued. She grasped objects slowly but without ataxia. The deep reflexes were all hyperactive. The plantar response was normal on the right, while on the left there was fanning of the digits, but without extension of the great toe. No focal weaknesses could be demonstrated in the extremities. There were no signs of wrist drop or of ankle drop. The cranial nerves were normal, and the responses to painful stimuli were acute. No pathologic changes were seen in the ocular fundi. Her mental age was found to be retarded more than 50 per cent, to a level of approximately 1 year.

Laboratory Examinations.—The findings[4] on examination of the blood were as follows: hemoglobin, 10.9 Gm. per hundred cubic centimeters (64 per cent); erythrocytes, 4,900,000 per cubic millimeter; leukocytes, 8,700 per cubic millimeter with 38 per cent polymorphonuclears, 58 per cent lymphocytes and 4 per cent monocytes; basophilic stippling in 9,600 erythrocytes per cubic millimeter, and no active or latent sickling. The anemia and the basophilic stippling were present in three later examinations of the blood. On November 9 the stippled cells numbered 36,500 per cubic millimeter, but they decreased until there was only an occasional stippled cell on November 18. One month later, on December 21, only 170 stippled cells per cubic millimeter were present, although anemia of the hypochromic type persisted, with 11 Gm. of hemoglobin per hundred cubic centimeters (65 per cent) and 4,900,000 erythrocytes per cubic millimeter.

Examination of the urine gave the following results: All of ten specimens examined between October 29 and December 1 contained large amounts of reducing substances giving 4 plus reactions to Benedict's solution. On quantitative examination, one specimen contained 2.5 per cent fermentable sugar and no nonfermentable sugar. A dextrose tolerance test gave the following results: In the preliminary fasting blood there was 75 mg. of dextrose and in the urine 2.24 per cent dextrose, or 1.54 Gm. A 50 per cent solution of 22.3 Gm. of dextrose was administered. The weight of the patient was 13.7 Kg. After the first hour the blood contained 106 mg. of dextrose per hundred cubic centimeters and the urine 3.3 per cent (0.53 Gm.). After the second hour the blood contained 99 mg. of dextrose per hundred cubic centimeters and the urine 3.36 per cent (0.65 Gm.). It is noteworthy that glycosuria was present with a fasting blood sugar level of 75 mg. per hundred cubic centimeters and that sugar was present in the urine one and two hours after ingestion of dextrose with simultaneous normal concentrations of sugar in the blood. The urine was examined for lead on November 1, and from

4. Given in milligrams per hundred cubic centimeters unless otherwise indicated.

the twenty-four hour specimen 0.9756 Gm. of lead was obtained, or 0.0057 mg. per hundred cubic centimeters.

Examination of the cerebrospinal fluid was done on October 30. The amount was 12 cc. The pressure was 220 mm. of water; the appearance was clear. The cell count was 4 per cubic millimeter, with 1 polymorphonuclear and 3 lymphocytes. The total amount of protein was 88 mg. (normal, 40 to 60 mg.); of dextrose, 68 mg., and of chlorides, 688 mg., as sodium chloride (normal, 660 to 720 mg.). On November 13 the pressure was normal. The cell count was 6 per cubic millimeter. The total amount of protein was 67 mg.; of dextrose, 67 mg., and of chlorides, 678 mg. On December 3 the total amount of protein was 31 mg.; of dextrose, 67 mg., and of chlorides, 699 mg.

On October 31 chemical analysis of the blood (fasting specimen) gave these data: nonprotein nitrogen, 30.4 mg.; chlorides, 644 mg.; dextrose, 79 mg., and carbon dioxide-combining power, 39.6 volumes per cent. On December 7 (fasting specimen) the findings were as follows: nonprotein nitrogen, 29.6 mg.; dextrose, 85 mg.; serum calcium, 11.1 mg.; inorganic phosphorus, 3.5 mg.; albumin, 4.7 per cent and globulin, 2.4 per cent.

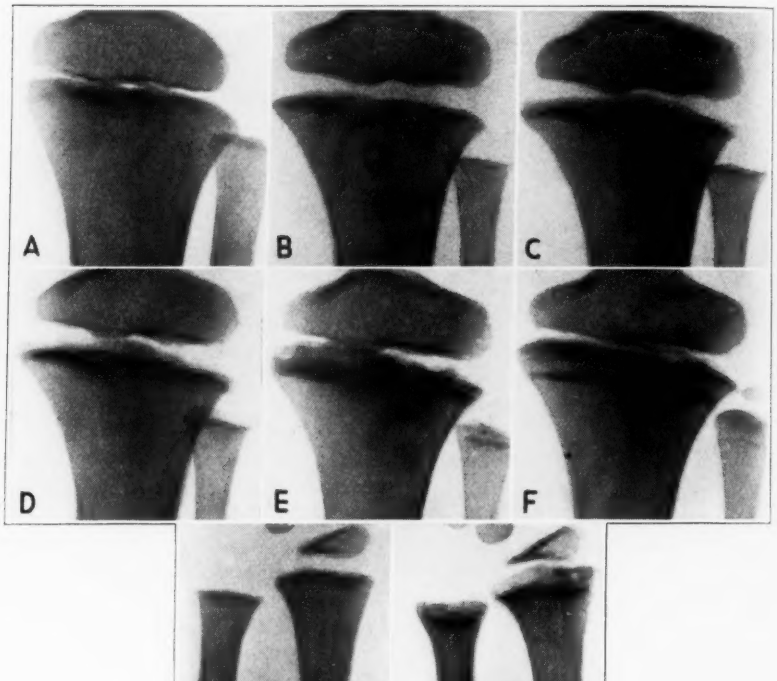
Course.—The patient resided in the hospital from October 29 until December 11. She was given sodium biphosphate (1 Gm. three times daily) throughout this period. The calcium therapy previously given in the clinic was discontinued. Massage was given during the last month of her stay, and brewers' yeast and wheat germ oil were administered during the last two weeks. She was always afebrile. The perversion of appetite persisted, and she chewed the crib, toys, clothes and bed clothing and tore restraining bandages with her teeth. Her gait was improved, but she was still somewhat ataxic when she left the hospital. At this time there were a definite increase in mental alertness and an improvement in behavior. She received no cod liver oil or other vitamin D preparation during her hospital residence.

After her discharge from the hospital there was rapid improvement at home, where she received 12 cc. of cod liver oil daily but no sodium biphosphate. The parents reported that her interest and attention rapidly increased; at present (April 1937) they consider her normal. She was playing actively and was getting on well with other children. The pica was reported to have disappeared completely after a few weeks, and she gained 4 pounds (1.8 Kg.) in four months. Examination in the outpatient department, however, revealed that there was still some residual ataxia, and she appeared apathetic, listless and noncommunicative.

Roentgen Examination.—Several roentgenograms of the skeleton were made during the period from Oct. 17, 1936, to April 20, 1937. The findings in all the bones were similar; for the sake of brevity and clarity, only the changes at the proximal end of the left tibia will be described in detail.

On October 17 and November 20 there was no roentgen evidence of a lead line. The density of the proximal end of the tibia was not greater than the density of an analogous portion of a normal bone (figure, *A* and *B*). The radiotranslucent zone between the end of the shaft and the center of ossification was abnormally deep (approximately 3 mm.), as compared with a similar zone (1 mm.) in a normal bone. Thus, in place of the zone of increased density across the end of the shaft usually seen in chronic lead poisoning, there was a zone of negative density. This deepening of the clear space between the shaft and the center of ossification was identical with the deep intermediate translucent zone shown in roentgenograms of patients with severe active rickets of the hypoplastic type. There were no additional

roentgen signs of active rickets. The edge of the shaft was sharply defined, without blurring or fraying. The trabecular markings in the shaft were normal in texture, and the cortices were not thinner than normal. The changes in the distal ends of the radii and ulnas were similar to those in the tibias, and in addition neither of these bones showed cupping or spreading of the ends of the shafts (figure, *G*). There was no osteoporosis. It was evident that the lead line had not developed across the ends of the shaft, but there was an accumulation of uncalcified tissue in this same terminal transverse segment of the diaphysis.



In these roentgenograms are shown changes in the bones of a 3½ year old patient with lead poisoning associated with active rickets. *A* shows the normal tibia of a patient of the same age. *B*, the tibia of a patient with active rickets photographed on Nov. 20, 1936, shows deep and intermediate rachitic zones without a lead line. *C*, *D* and *E* show progressive healing of the rickets and gradual development of the lead line, on Nov. 26 and Dec. 5, 1936, and Jan. 7, 1937. *F*, taken on Feb. 5, 1937, after the rickets was completely healed, shows the heavy lead line. *G*, the radius and ulna photographed on Nov. 20, 1936, when the rickets was active, shows deep rachitic intermediate zones without lead lines. *H*, taken on Jan. 5, 1937, when the rickets was healing, shows fraying and some cupping of the ends of the shafts and partially developed lead lines.

On November 27, thirty days after the withdrawal of cod liver oil and twenty-eight days after the initiation of phosphate therapy, a faint horizontal linear shadow approximately parallel to the end of the shaft was present and

extended well out into the translucent intermediate zone, about 2 mm. from the diaphysial edge (figure, *C*). This was interpreted as early recalcification of the provisional zone of calcification, a pathognomonic sign of healing rickets in the early stage.

In the roentgenograms made on Dec. 5, 1936, and Jan. 5 and Feb. 15, 1937 (figure, *D*, *E* and *F*), the provisional zones of calcification appeared progressively deeper and more dense. Coincidentally, the clear zone between the new provisional zone of calcification and the old end of the shaft became filled in with irregular heavy opaque shadows, which in the last roentgenogram (figure, *F*) completely occupied the previously invisible intermediate rachitic zone. At this time (February 15) there were two heavy silvery bands across the end of the shaft, one at the cartilage-shaft junction and a deeper one at the exact level of the old end of the shaft. These were considerably heavier and more dense than I have seen before in cases of healing rickets with overcalcification and were similar to the heavy metallic transverse bands seen in other cases of lead poisoning. The phenomenon of the double zone in the lead band has been described before.[1c] The continued deposition of lead in the skeleton of this patient for several weeks after the cessation of ingestion of lead was also an interesting feature of one of my first cases of lead poisoning with skeletal changes.[1c] This is probably due to the transfer of lead from other tissues to the skeleton for many weeks after the ingestion of lead has stopped, the lead being withdrawn, particularly from the liver.

In the distal ends of the radius and of the ulna, where the signs of healing appeared several weeks later than in the tibia, cupping and fraying of the ends of the shafts became evident (figure, *H*). These changes were completely absent before the signs of healing were seen.

COMMENT

There can be little question that both chronic lead poisoning and active rickets were present synchronously in this patient. The history of the ingestion of lead, the basophilic stippling in the erythrocytes, the glycosuria, the excessive protein content of the cerebrospinal fluid and, finally, the presence of significant amounts of lead in the urine were all indicative of plumbism. The roentgenograms showed unmistakable rickets. The widening of the nonopaque intermediate zone occurs only in rickets. The appearance of a new provisional zone of calcification and the progressive calcification of the intermediate zone are pathognomonic of healing rickets.

The failure of the lead line to develop in bones during the course of active rickets can be explained by the close parallelism between the metabolism of lead and the metabolism of calcium, which has already been demonstrated in animals. Aub and his co-workers [5] showed that lead, like calcium, is deposited in bone as a phosphate rather than uniting directly with the proteins of the organic matter. They also demonstrated that viable cartilage has the power to remove lead as

5. Aub, J. C.; Fairhall, L. T.; Minot, A. S., and Reznikoff, P.: Lead Poisoning, Medicine **4**:1, 1925.

well as calcium from its surrounding medium in vitro. They concluded from their experimental studies that since both lead and calcium are held in the body at a common site, and since the chemical behavior of their salts in vitro is similar, it is probable that the same physiologic conditions favor the liberation or the retention of the two. Moreover, Hunter and Aub [6] confirmed the existence of close analogies between calcium metabolism and lead metabolism in human subjects when they found a considerable excretion of lead after the administration of parathyroid extract to six patients with lead poisoning. Park and his associates [7] stated that lead is so closely related to calcium in its reaction with phosphorus that the intercellular substance of the growing cartilage must keep taking lead out of the circulation exactly as it does calcium.

These same investigators [7] have emphasized the fact that the persistence and increase of the calcified preparatory cartilage is by far the most striking phenomenon produced by lead in a growing bone. This is the source of the heavy transverse shadow at the ends of the bones of patients with lead poisoning. Since an essential pathologic feature of active rickets is the failure of calcification of the preparatory cartilage,[8] it follows that when active rickets and plumbism are present in combination the lead lines cannot develop in the bones because calcification of the preparatory cartilage ceases. When lead poisoning and active rickets are present in combination there are two antagonistic mechanisms in simultaneous operation in the preparatory cartilage—one (the result of lead poisoning) causes an excessive calcification and leadification of the preparatory cartilage, while the second or rachitic component prevents the deposition of calcium and lead in the same site. When the rachitic process is severe, as one must infer was the case during the earlier phase of the period of observation of this patient, then the preparatory cartilage will not absorb calcium or lead and the characteristic lead line will be absent. Both calcification and leadification of the preparatory cartilage fail in cases of active rickets. This results in a layer of radiotranslucent uncalcified cartilage and osteoid material in the terminal segments of the bone in place of the excess of radiopaque calcified and leadified cartilage which develops in plumbism without associated rickets and which is responsible for the lead line in

6. Hunter, D., and Aub, J. C.: Lead Studies: XV. The Effects of Parathormone on the Excretion of Lead and of Calcium in Patients Suffering from Lead Poisoning, Quart. J. Med. **20**:123, 1927.

7. Park, E. R.; Jackson, D.; Goodwin, T. C., and Kajdi, L.: X-Ray Shadows in Growing Bones Produced by Lead: Their Characteristics, Cause, Anatomical Counterpart in Bone and Differentiation, J. Pediat. **3**:265, 1933.

8. Hess, A. F., and Weinstock, M.: The Value of Elementary Phosphorus in Rickets, Am. J. Dis. Child. **32**:483 (Oct.) 1926.

roentgenograms. It is probable that active rickets would cause an absence of bismuth lines [9] in the same way and for similar reasons.

There are several features in this case which suggest that the rickets was not caused by a deficiency of vitamin D. The disease developed during the administration of amounts of cod liver oil which are usually found adequate and was present in October, having evidently persisted through the summer, when exposure to ultraviolet radiation from natural sources is maximal. Also, the rachitic lesions were healing four weeks after cod liver oil was discontinued and four weeks after administration of sodium biphosphate was begun. This healing occurred in November and December, when the atmospheric content of ultraviolet radiation is relatively low and usually insufficient to cause a remission in active severe rickets.

Both the development of rickets under these conditions and its virtually spontaneous healing raise the question as to whether the presence of rickets in this patient might not be better explained on a dietary basis; that is, whether the added intake of lead might not have produced low phosphate rickets. Shelling [10] produced severe rickets in rats by substituting equimolar amounts of lead for calcium in the Steenbock rachitogenic diet so that the total amounts of calcium and lead were equivalent to the total amount of calcium in the usual Steenbock diet, or approximately four times the amount of the phosphorus. Rickets has also been produced in rats by the addition to the diet of several other cations which are excreted as insoluble phosphates in the feces. Low phosphate rickets has been induced in rats by the addition of strontium,[11] magnesium,[12] iron [13] and beryllium.[14] Buschke and Peiser [15]

9. Caffey, J.: Changes in the Growing Skeleton After the Administration of Bismuth, Am. J. Dis. Child. **53**:56 (Jan.) 1937.

10. Shelling, D. H.: Effect of Dietary Calcium and Phosphorus in the Toxicity of Lead in the Rat: Rationale of Phosphate Therapy, Proc. Soc. Exper. Biol. & Med. **30**:248, 1932.

11. Stoeltzner, H.: Ueber den Einfluss von Strontiumverfütterung auf die chemische Zusammensetzung des wachsenden Knochens, Biochem. Ztschr. **12**:115, 1908. Shipley, P. G.; Park, E. A.; McCollum, E. V.; Simmonds, S., and Kinney, E. M.: Effects of Strontium Administration on the Histological Structure of Growing Bones, Bull. Johns Hopkins Hosp. **33**:216, 1922.

12. Meyer zu Hörste, G.: Experimentelle Rattenrachitis: III. Magnesiumrachitis, Monatschr. f. Kinderh. **54**:203, 1932.

13. Waltner, K.: Ueber die Wirkung grosser Mengen Eisens: I. Ueber die Wirkung des Eisens auf die Knochenentwicklung, Biochem. Ztschr. **188**:381, 1927. Brock, J. F., and Diamond, L. K.: Rickets in Rats by Iron Feeding, J. Pediat. **4**:442, 1934.

14. Guyatt, B. L.; Kay, H. D., and Branion, H. D.: Beryllium "Rickets," J. Nutrition **6**:313, 1933.

15. Buschke, A., and Peiser, B.: Ueber schwere Schleimhaut- und Knochenveränderungen bei Ratten durch experimentelle Thalliumwirkung, Klin. Wchnschr.

(Footnote continued on next page)

also produced rickets in rats by the administration of thallium. They stated the belief that the changes in cases of thallium rickets are of endocrine origin and that thallium causes hyperparathyroidism. There are not sufficient chemical data in their paper to determine whether the rickets was of the low phosphate type. They mentioned that the administration of lead and of mercury also caused rickets in single animals.

It should be emphasized that the experimental dietary rickets seen in rats has no counterpart in clinical experience and particularly that rickets has not been evident in any of the large number of roentgen observations of the skeleton reported in studies on human plumbism. In the case reported here there was no gross deficiency of phosphorus in the diet. However, the ingestion of lead continued over an unusually long period (three years), and since the actual quantity of lead swallowed is not known its amount may well have been sufficiently great to increase the ratio of calcium plus lead to phosphorus to a degree capable of inducing low phosphate rickets. Many features of the behavior of the rickets in this patient suggest this dietary etiologic mechanism, repeatedly demonstrated experimentally in rats but unreported to date in studies on human rickets.

It must be admitted, however, that, in view of the patient's apparently adequate intake of cod liver oil over a period of three years, it is difficult to understand why her absorption of lead was so gradual and why her symptoms of plumbism failed to take a more acute clinical form.

SUMMARY

A case of chronic lead poisoning with synchronous active rickets in a child 3½ years of age is described.

Evidences of lead lines in the bones were absent from the early roentgenograms, but appeared coincidentally with the healing of the rickets.

The absence of lead lines in the skeleton during active rickets is explained by the close parallelism in the deposition of calcium phosphate and that of lead phosphate in growing cartilage. Evidence is presented indicating that the lead lesions cannot develop during active rickets because the skeletal changes in lead poisoning and in active rickets are antagonistic both physiologically and anatomically.

Experimental lead rickets in rats and the possibility of lead rickets in human plumbism are discussed.

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2:1458 (July 30) 1923. Peiser, B., and Buschke, A.: Experimentelle Erzeugung rachitisähnlicher Knochenveränderungen und ihre Deutung im Sinne einer Organsystemerkrankung, ibid. **3**:523 (March 25) 1924.

Progress in Pediatrics

PRIMARY CARCINOMA OF THE LIVER IN CHILDHOOD

REPORT OF TWO CASES, WITH A CRITICAL REVIEW OF THE LITERATURE

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Primary carcinoma of the liver in children is a pathologic entity of unusual occurrence. Although the greatest incidence of this type of tumor is between the ages of 40 and 60 years, the number of children's cases reported in the literature is sufficient to warrant a consideration of primary neoplasm in the differential diagnosis of enlargements of the liver in childhood. Although various authors have collected and tabulated cases of primary carcinoma of the liver in children, there has been no uniformity of opinion concerning the authenticity of many reports. Philipp [1] in 1907 reviewed 29 cases and accepted 12 as genuine. Castle [2] in 1914 cited 42 cases of children up to 16 years of age. Griffith [3] in 1918 reviewed all the previous cases and tabulated 57, including his own. Kilfoy and Terry [4] in 1929 collected from the literature 44 cases of children under 16 years of age.

I have reviewed 105 cases of primary carcinoma of the liver in children under 16 years of age, of which 75 have presented definite evidence justifying the diagnosis (table 1). Cases have been omitted from this review for the following reasons: The diagnosis was made without postmortem examination; there was not enough evidence that secondary metastases to the liver had been excluded; the evidence for carcinoma was not sufficient from the microscopic report, or the diagnosis reported was other than primary carcinoma of the liver, e. g., sarcoma, lymphosarcoma, mixed cell tumor or parasitic cysts of the

From the Division of Pathology and Department of Pediatrics, the Jewish Hospital.

1. Philipp, P. W.: Ueber Krebsbildungen im Kindesalter, Ztschr. f. Krebsforsch. **5**:361, 1907.

2. Castle, O. L.: Primary Carcinoma of the Liver in Childhood, Surg., Gynec. & Obst. **18**:477, 1914.

3. Griffith, J. P. C.: Primary Carcinoma of the Liver in Infancy and Childhood, Am. J. M. Sc. **155**:79, 1918.

4. Kilfoy, E. J., and Terry, M. C.: Primary Carcinoma of the Liver in Childhood, Surg., Gynec. & Obst. **48**:751, 1929.

TABLE 1.—*Primary Carcinoma of the Liver in Children Under Sixteen Years of Age*

Case	Author	Year	Age	Sex	Diagnosis	Comment
1	Noeggerath [26]	1854	1 day	F	Medullary carcinoma (liver cell)	
2	Widerhofer, H.: Jahrb. f. Kinderh. **2**: 191, 1859	1859	3 days	M	Primary carcinoma (liver cell)	
3	West, Charles: Lectures on Diseases of Infancy and Childhood, ed. 5, London, Longman and others, 1865, p. 706	1865	8 mo.	M	Medullary carcinoma (liver cell)	Metastasis to right lung
4	Hofmann, K.: Wien. med. Wchnschr. **16**: 943, 1866	1866	8 mo.	M	Primary carcinoma (unclassified)	Metastasis to pancreas and mesenteric lymph nodes
5	Roberts, W.: Lancet **1**: 77, 1867	1867	12 yr.	F	Primary carcinoma (unclassified)	
6	Gee, S. J.: St. Barth. Hosp. Rep. **7**: 143, 1871	1871	5 wk.	M	Primary carcinoma (liver cell)	
7	Kaltmann, H., in Gerhardt, C.: Handbuch der Kinderkrankheiten, Tübingen, H. Laupp, 1879, vol. 4, p. 829	1872	9 yr.	F	Primary carcinoma (liver cell)	
8	Pepper, W.: Tr. Path. Soc. Philadelphia **4**: 97, 1873	1873	2 mo.	?	Primary carcinoma (unclassified)	
9	Affleck, T. R.: Tr. Edinburgh Obst. Soc. **4**: 58, 1875	1875	17 mo.	M	Primary carcinoma (liver cell)	
10	Lewiss, D.: Centr.-Ztg. f. Kinderh. **1**: 73, 1877	1877	13 yr.	M	Medullary carcinoma (liver cell)	
11	Birch-Hirschfeld, F. V., in Gerhardt, C.: Handbuch der Kinderkrankheiten, Tübingen, H. Laupp, 1879, vol. 4, p. 828	1878	12 yr.	M	Adenocarcinoma (liver cell)	Metastasis to lung
12	Wulff, H. F.: Der primäre Leberkrebs, Tübingen, H. Laupp, 1876; cited by Gerhardt, C.: Handbuch der Kinderkrankheiten, Tübingen, H. Laupp, 1879, vol. 4, p. 827	1878	3 yr.	F	Adenocarcinoma (liver cell)	Extension into portal and hepatic veins
13	Leichtenstern, O., in von Ziemssen, H.: Handbuch der speciellen Pathologie und Therapie, Leipzig, F. C. W. Vogel, 1878, vol. 8, p. 321	1878	7 mo.	M	Primary carcinoma (unclassified)	
14	Pye-Smith, P. H.: Lancet **1**: 405, 1880	1880	14 yr.	M	Primary carcinoma (liver cell)	Metastasis to lungs; extension into hepatic veins
15	Henschen, G. E.: Jahrb. f. Kinderh. **23**: 468, 1885	1884	14 yr.	F	Medullary carcinoma (liver cell)	Compression and extension into inferior vena cava
16	Bohn, H., in Langenbuch, C.: Chirurgie der Leber und Gallenblase, Stuttgart, F. Enke, 1897, vol. 2, p. 58	1885	6 mo.	M	Primary carcinoma (liver cell)	
17	Deschamps, M. E.: France méd. **1**: 809, 1885	1885	11 yr.	M	Primary carcinoma (liver cell)	
18	St. J. Kinderhospital, Abstr., Arch. f. Kinderh. **7**: 138, 1886	1886	20 mo.	F	Primary carcinoma (unclassified)	
19	Ollivier, M., cited by Musser, in Keating, J. M.: Cyclopaedia of the Diseases of Children, Medical and Surgical, Philadelphia, J. B. Lippincott Co., 1890, vol. 3, p. 461	1890	18 mo.	F	Medullary carcinoma (liver cell)	
20	Fussel, M. H., and Kelley, A. O. J.: Tr. A. Am. Physicians **10**: 116, 1895	1895	16 yr.	F	Primary carcinoma (liver cell)	
21	Engelhardt, H.: München. med. Wchnschr. **47**: 631, 1900	1900	14 yr.	F	Primary carcinoma (liver cell)	Metastasis to pleura and pericardium
22	Acland, T. D., and Dudgeon, L. S.: Lancet **2**: 1310, 1902	1902	15 yr.	M	Primary carcinoma (liver cell)	Extension into portal and hepatic veins; metastasis to lungs and mediastinal lymph nodes

23	Lubarsch, O., cited by Philipp,[1] p. 326	1902	7 yr.	F	Primary carcinoma (liver cell)	Extension into hepatic and portal veins; metastasis to lung
24	Schlesinger, E.: Jahrb. f. Kinderh. **55**: 300, 1902	1902	4 yr.	M	Primary carcinoma (unclassified)	
25	Bonome, A.: Attir. Ist. Veneto di sc., lett. ed. arti **3**: 259, 1900-1901; abstr., Wells, H. G.: Am. J. M. Sc. **126**: 409, 1903	1903	11 yr.	M	Adenocarcinoma (liver cell)	Metastasis to lung
26	Burt, S. S.: Post-Graduate **18**: 991, 1903	1903	12 yr.	M	Primary carcinoma (liver cell)	
27	Mattirolo, G.: Gazz. d. osp. **26**: 732, 1905	1905	9 yr.	M	Adenocarcinoma (liver cell)	
28	Petrone, G. A.: Pediatria **15**: 179, 1907	1905	4 mo.	F	Adenocarcinoma (liver cell)	Metastasis to lung
29	Sotow, A. D.: Deutsche med. Wchnschr. **96**: 14, 1903; cited by Steffen, A.: Die malignen Geschwülste im Kindesalter, Stuftgart, F. Enke, 1905, p. 84	1905	18 mo.	M	Primary carcinoma (unclassified)	Metastasis to lungs
30	Wegelin [29]	1905	5½ yr.	M	Adenocarcinoma (liver cell)	Metastasis to lungs and lymph nodes
31	Miller, C. H., and Cleland, J. B.: Arch. Path. Inst. London Hosp. **1**: 5, 1906	1906	9 mo.	M	Primary carcinoma (liver cell)	
32	Miller, C. H., and Cleland, J. B.: Arch. Path. Inst. London Hosp. **1**: 5, 1906	1906	7 mo.	M	Primary carcinoma (liver cell)	
33	Plaut, Max: Arch. f. Kinderh. **43**: 249, 1906	1906	14 mo.	M	Primary carcinoma (unclassified)	Metastasis to tracheobronchial and mesenteric lymph nodes and lungs
34	Philipp [1]	1908	9 mo.	M	Adenocarcinoma (liver cell)	
35	Hippel, B.: Virchows Arch. f. path. Anat. **201**: 326, 1910	1910	21 mo.	F	Adenocarcinoma (liver cell)	
36	Karsner [11]	1911	11 yr.	F	Carcinoma liver (unclassified)	
37	Karsner [11]	1911	8 yr.	M	Carcinoma liver (liver cell)	Extension into and thrombosis of portal vein; metastasis to lungs
38	Mair [28]	1911	6 yr.	M	Adenocarcinoma (liver cell)	
39	Idzumi, G.: Arch. f. klin. Chir. **100**: 1181, 1913	1912	7 mo.	M	Primary carcinoma (unclassified)	
40	LaPage, C. P.: Proc. Roy. Soc. Med. **6**: 45, 1913	1912	6 yr.	M	Primary carcinoma (unclassified)	Extension into hepatic vein and inferior vena cava; metastasis to lungs
41	Peiper, A.: Jahrb. f. Kinderh. **75**: 690, 1912	1912	9 mo.	F	Primary carcinoma (unclassified)	
42	Castle [2]	1914	10 mo.	M	Primary carcinoma (liver cell)	
43	Freeman, W. T.: Lancet **2**: 157, 1914	1914	3 yr.	M	Adenocarcinoma (liver cell)	
44	Hance, G. J.: Lancet-Clinic **116**: 151, 1916	1916	5 yr.	M	Primary carcinoma (liver cell)	Extension into inferior vena cava
45	Frølich, T.: Norsk mag. f. lægevidensk. **78**: 18, 1917	1917	1 yr.	M	Primary carcinoma (unclassified)	
46	Griffith [3]	1918	21 mo.	F	Primary carcinoma (bile duct)	
47	Herzog, G.: München. med. Wchnschr. **65**: 950, 1918	1918	13 yr.	F	Primary carcinoma (liver cell)	Metastases to lymph node, pulmonary veins and spleen
48	Wollstein, M., and Mixsell, H. R.: Arch. Pediat. **36**: 268, 1919	1919	8½ mo.	F	Primary carcinoma (liver cell)	Metastasis to lung
49	Mieremet, C. W. G.: Ztschr. f. Krebsforsch. **17**: 268, 1930	1920	11 mo.	M	Primary carcinoma (unclassified)	Associated with tuberculosis of liver, lung and spleen

TABLE 1.—*Primary Carcinoma of the Liver in Children Under Sixteen Years of Age—Continued*

Case	Author	Year	Age	Sex	Diagnosis	Comment
50	Dansie [5]	1922	10 wk.	M	Primary carcinoma (bile duct)	
51	Takaidzumi, M.: Gann **16**: 31, 1922	1922	9 yr.	M	Primary carcinoma (liver cell)	
52	Nicoloysen, L.: Norsk mag. f. lægevidensk. **85**: 719, 1924	1924	20 mo.	M	Primary carcinoma (unclassified)	
53	Poujol, G., and Lagrot, F.: Arch. franç. de path. gén. et expér., no. 9, 1924, p. 1	1924	14 yr.	M	Adenocarcinoma (liver cell)	Associated with cirrhosis
54	Arrigoni, C.: Policlinico (sez. prat.) **32**: 873, 1925	1925	10 yr.	M	Adenocarcinoma (liver cell)	
55	Bridel, P.: Thesis, Lausanne, Imprimeries Réunies S. A., 1925	1925	6 mo.	M	Carcinoma hepatocellulare solidum	
56	Rosenbusch, H.: Virchows Arch. f. path. Anat. **261**: 326, 1926	1926	8 mo.	M	Primary carcinoma (liver cell)	
57	Mikula, M., and Klein, F.: Bratisl. lékar. listy **7**: 649, 1927	1927	7 mo.	M	Primary carcinoma (unclassified)	
58	Neff, F. C.; Engel, L. P., and Helwig, F. C.: J. Kansas M. Soc. **27**: 225, 1927	1927	13 yr.	F	Primary carcinoma (liver cell)	
59	Fox and Bartels [20]	1928	13 yr.	F	Primary carcinoma (liver cell)	Metastases to abdominal lymph nodes
60	Stolz, J., and Bicart, P.: J. de méd. de Paris **48**: 514, 1928	1928	13 mo.	M	Primary carcinoma (unclassified)	
61	Kilfoy and Terry [4]	1929	9 yr.	F	Adenocarcinoma (liver cell)	Metastases to lungs
62	Taillens, J.: Rev. méd. de la Suisse Rom. **50**: 607, 1930	1930	6 mo.	M	Carcinoma hepatocellulaire solidum	Metastases to lungs
63	Cantele, P. G.: Tumori **5**: 233, 1931	1931	6 yr.	F	Primary carcinoma (liver cell)	
64	Ganelli, E., and Predaroli, T.: Pediatria **39**: 1089, 1931	1931	5½ mo.	M	Primary carcinoma (liver cell)	
65	Pierson, M., and Campbell, M.: J. Michigan M. Soc. **31**: 482, 1932	1932	14 mo.	M	Primary carcinoma (bile duct cell)	
66	Pirie, G. R.: Canad. M. A. J. **27**: 401, 1932	1932	8 mo.	M	Primary carcinoma (liver cell)	
67	Pirie, G. R.: Canad. M. A. J. **27**: 401, 1932	1932	8 mo.	M	Primary carcinoma (liver cell)	
68	Pirie, G. R.: Canad. M. A. J. **27**: 401, 1932	1932	11 yr.	F	Primary carcinoma (liver cell)	
69	Ducas, P., and Albot, G.: Arch. de méd. d. enf. **36**: 595, 1933	1933	15 mo.	M	Primary carcinoma (liver cell)	
70	Hagaman, G. K.: Minnesota Med. **17**: 40, 1934	1934	6 mo.	F	Adenocarcinoma (liver cell)	Metastases to lung
71	Gjørup, E.: Hospitalstid. **78**: 211, 1935	1935	13 yr.	M	Primary carcinoma (liver cell)	Metastases to abdominal lymph nodes
72	Jamieson, E. N.: Edinburgh M. J. **42**: 247, 1935	1935	3¾ yr.	M	Primary carcinoma (liver cell)	
73	McRae, F. W.: Am. J. Surg. **28**: 575, 1935	1935	6 mo.	F	Primary carcinoma (liver cell)	
74	Nobécourt, P., and Ducas, P.: Arch de méd. d. enf. **38**: 605, 1935	1935	5 yr.	M	Primary carcinoma (unclassified)	
75	Péclard: J. de méd. de Paris **55**: 578, 1935	1935	14 mo.	M	Primary carcinoma (unclassified)	
76	Steiner	1937	4 mo.	F	Primary carcinoma (liver cell)	Extension into hepatic veins; metastases to lungs
77	Steiner	1937	16 mo.	M	Primary carcinoma (liver cell)	Extension into hepatic veins; metastases to lungs

liver. In 1922 Dansie [5] tabulated cases of various primary tumors of the liver in infants under 2½ years of age. Subsequent reports of Dansie's cases (Bauman and Forbes, Butler, Cornil, Dalton, Heaton, Henoch, Hewlett, Langmead, Lendrop, Meisenbach, Parker and Powell) have been omitted. Later reports of cases first cited in the tables of Griffith [3] and of Kilfoy and Terry [4] (Grawitz, Gross, Markwald [5 cases], Milne, Miwa and Saito, Miwa and Utsumi, Nagasawa and Nakamura, Yamagiwa) have also been omitted. Isolated cases reported in the literature (Condat, de Hann, Harbitz and Platow, Henke and Honda) have not been included in this review.

The literature of primary carcinoma in adults contains excellent reviews with lengthy discussions concerning the etiology, pathogenesis, incidence and histopathologic features of this type of neoplasm. The works of Sabourin [6] and of Hanot and Gilbert [7] were instrumental in clearing up a good deal of the confusion which had pervaded this field since Rokitansky, in 1849, maintained that a malignant hepatic growth can exist as a primary disorder. Despite Virchow's warning about the necessity of careful search for the primary source of all tumors of the liver, many cases were reported which were later held unacceptable. Thus Eggel [8] in reviewing the literature up to 1901 was able to accept only 117 of the 163 cases as authentic by histologic criteria. Later authors have contributed considerably (Wheeler,[9] Goldzieher and von Bokay,[10] Karsner,[11] Yamagiwa,[12] Winternitz,[13] Clawson and Cabot,[14]

5. Dansie, C. B.: Primary Growths of the Liver in Infants, Lancet **2**:228 (July 29) 1922.

6. Sabourin, C.: Contribution a l'étude des lésions due parenchyme hépatique dans la cirrhose: Essai sur l'adenome du foie, Thesis, Paris, no. 39, 1881.

7. Hanot, V. C., and Gilbert, A.: Études sur les maladies du foie, Paris, Asselin & Hauzeau, 1888.

8. Eggel, H.: Ueber das primäre Karzinom der Leber, Beitr. z. path. Anat. u. z. allg. Path. **30**:506, 1901.

9. Wheeler, F. J.: Some Observations on Primary Carcinoma of the Liver, Guy's Hosp. Rep. **48**:225, 1909.

10. Goldzieher, M., and von Bokay, Z.: Der primäre Leber Krebs, Virchows Arch. f. path. Anat. **203**:75, 1910.

11. Karsner, H. T.: A Clinicopathological Study of Carcinoma of the Liver, Arch. Int. Med. **8**:238 (Aug.) 1911.

12. Yamagiwa, K.: Zur Kenntnis des primären parenchymatösen Leberkarcinoms (Hepatoma), Virchows Arch. f. path. Anat. **206**:437, 1911.

13. Winternitz, M. C.: Primary Carcinoma of the Liver, Johns Hopkins Hosp. Rep. **17**:143, 1916.

14. Clawson, B. J., and Cabot, V. S.: Primary Carcinoma of the Liver, J. A. M. A. **80**:909 (March 31) 1923.

Friedenwald and Fried,[15] Counseller and McIndoe,[16] Fried,[17] Smith,[18] von Glahn and Lamb,[19] Fox and Bartels,[20] Strong and Pitts,[21] Barry and Rossum,[22] Tull,[23] Brines,[24] and Boyce and McFetridge [25]).

The collected material on both adults and children obtained from several American and European hospitals shows a total of 144 instances of this condition in 65,501 autopsies, an incidence of 0.219 per cent. Reports from Asia and Africa cite 416 instances in 39,701 necropsies, an incidence of 1.05 per cent. The higher incidence in some regions is well illustrated in the report of Tull [23] from the Tan Tock Hospital in Singapore, which cites 134 instances in 17,664 necropsies, an incidence of 0.76 per cent.

REPORT OF CASES

CASE 1.—*Clinical History.*—A 4 month old girl was admitted to the Jewish Hospital with vomiting, constipation and irritability of about four days' duration. She appeared to be in perfect health until about four days prior to admission, when she began to vomit her morning feedings. Constipation later developed; she became irritable and lost some weight.

On admission she was well developed and well nourished. The temperature was 100 F. In the epigastrium, extending from just above the umbilicus to the anterior axillary line on each side, was a firm mass, dull to percussion. On its anterior surface there were some fluctuant, nodular areas; the lower edge of the mass was definite and sharp. The overlying skin was stretched and showed some distended venules. The remainder of the abdomen was soft, and there were no other unusual findings.

An exploratory laparotomy revealed a markedly enlarged liver, which was smooth throughout except for several nodular excrescences on the diaphragmatic

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15. Friedenwald, J., and Fried, H.: Primary Carcinoma of the Liver, Am. J. M. Sc. **168**:875, 1924.

16. Counseller, V. S., and McIndoe, A. H.: Primary Carcinoma of the Liver, Arch. Int. Med. **37**:363 (March) 1926.

17. Fried, B. M.: Primary Carcinoma of the Liver, Am. J. M. Sc. **168**:241, 1924.

18. Smith, L. W.: Four Unusual Tumors of the Liver, Arch. Path. **1**:365 (March) 1926.

19. von Glahn, W. C., and Lamb, A. R.: Primary Carcinoma of the Liver, M. Clin. North America **8**:29, 1924.

20. Fox, R. A., and Bartels, G. W.: Primary Carcinoma of the Liver, Arch. Path. **6**:228 (Aug.) 1928.

21. Strong, G. F., and Pitts, H. H.: Primary Carcinoma of the Liver, Arch. Int. Med. **46**:105 (July) 1930.

22. Barry, M. W., and Rossum, B. C.: Primary Carcinoma of the Liver, Nebraska M. J. **16**:312, 1931.

23. Tull, J. C.: Primary Carcinoma of the Liver, J. Path. & Bact. **35**:557, 1932.

24. Brines, O. A.: Primary Carcinoma of the Liver, Am. J. Clin. Path. **3**:221, 1933.

25. Boyce, F. F., and McFetridge, E. M.: Primary Carcinoma of the Liver with Report of Twenty-Eight Cases, Internat. S. Digest **18**:67, 1934.

aspect; these were cystic, and the overlying liver tissue showed red discoloration. The gallbladder, spleen, adrenal glands, stomach and intestines appeared normal. There was some red cloudy fluid in the peritoneal cavity. The child seemed to do well for about one hour after the operation and then suddenly ceased to breathe.

The clinical diagnosis was enlargement of the liver (malignant) with sanguineous peritoneal exudate.

Postmortem Observations.—At necropsy the skin was pale but not icteric. The superficial lymph nodes were not palpable. The appearance of the head, neck and chest was not unusual. There was about 50 cc. of blood-tinged fluid in the peritoneal cavity; the peritoneal surfaces were smooth and glistening. The mesenteric lymph nodes were not enlarged. The inferior margin of the liver extended

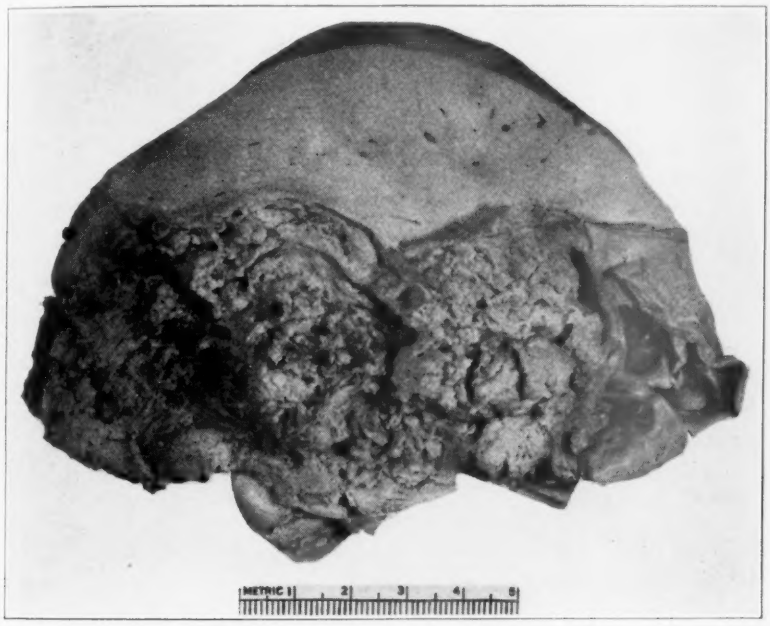

Fig. 1 (case 1).—Cut surface of the liver, showing that a large portion of the right lobe has been replaced by tumor tissue. Note the sharp demarcation of the tumor from the rest of the liver.

7.5 cm. below the costal border in the right midclavicular line, 8.5 cm. below the xiphoid process and 3.5 cm. below the costal border in the left midclavicular line. The pleural cavities contained no excess of fluid, and the surfaces were smooth and glistening. The pericardial cavity was not unusual in appearance.

The lungs contained air. The pleural surfaces were smooth and pale; the cut surfaces were uniformly pale red and exuded a small amount of frothy fluid.

The liver was firm and weighed 450 Gm. The external surface was brownish red and smooth; there were several nodular elevations, up to 3 cm. in diameter, on the anterior and superior surfaces of the right lobe. Over these the liver was dark brown and soft. Visible on the cut surface of the right lobe was a region measuring 8 by 6 by 6 cm. composed of soft, friable, grayish red granular tissue with large irregular blood spaces and thick, fibrous strands. This region was

surrounded by a rim of hepatic tissue, up to 3 cm. in width, in which the markings were indistinct. The portal veins in the region of the tumor were thrombosed and in places were filled with tumor tissue. The inferior vena cava was somewhat compressed. Elsewhere the cut surface of the liver was made up of minute, pale yellow areas with central red dots surrounded by broad red zones (fig. 1).

The remaining organs presented nothing unusual. The lymph nodes showed no metastases.

Microscopic Observations.—The pulmonary pleura was delicate and loose. The air spaces of the lungs were irregular and contained homogeneous material which

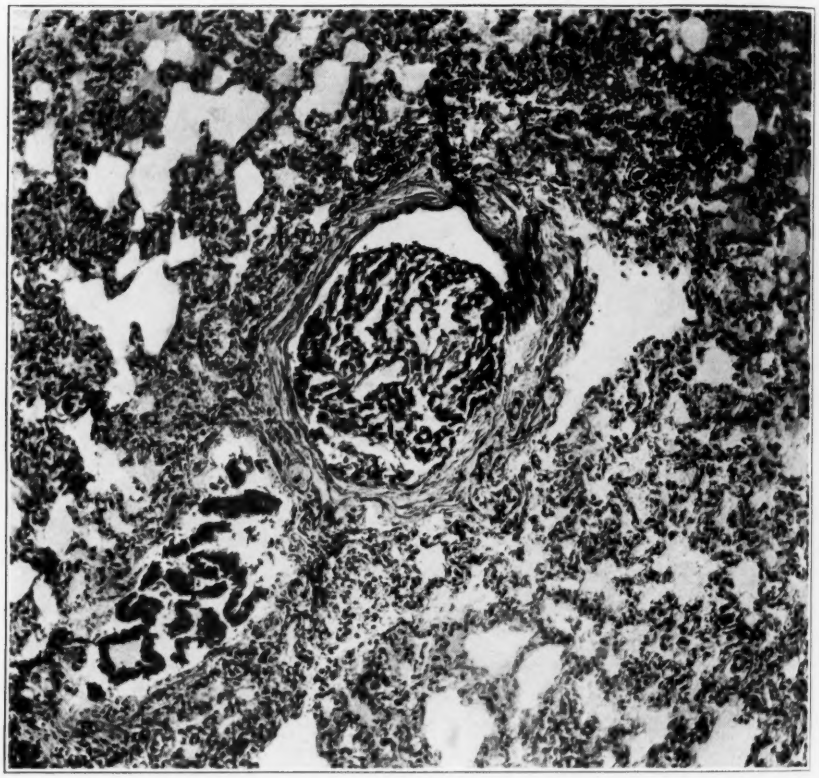

Fig. 2 (case 1).—Section of a lung, showing tumor metastases in the pulmonary vessel. (Hematoxylin and eosin stain; × 80.)

took a light pink stain; the interalveolar septums were broad, and the capillaries were engorged with blood. The lining cells of the bronchioles were desquamated. The blood vessels were distended with red cells and in places contained emboli of neoplastic epithelial cells similar to those seen in the liver (fig. 2).

Portions of hepatic tissue were replaced by nests of epithelial cells, many of which were arranged in columns and sheets, while others were loosely distributed. The cells varied in size, shape and staining characteristics. Many were polyhedral, while others were spindle shaped, with long, delicate cytoplasmic processes. The nuclei were large, oval and vesicular, with fine chromatin material and thick

nuclear membranes. Other nuclei varied markedly in size and were pyknotic and hyperchromatic. Some were large and bizarrely shaped, with coarse chromatin material and thin nuclear membranes. Few mitotic figures were noted. There was no biliary secretion. The stroma consisted of loosely arranged delicate fibrils, which in places resembled myxomatous tissue. Broad bands of hyalinizing connective tissue extended throughout, separating tumor cells into irregular areas. Well preserved bile ducts were noted in these. Elsewhere in the tumor tissue periportal areas were discernible. In the adjacent hepatic tissue the liver cords were thin and fragmented, and the cells were poorly stained. In the unaffected

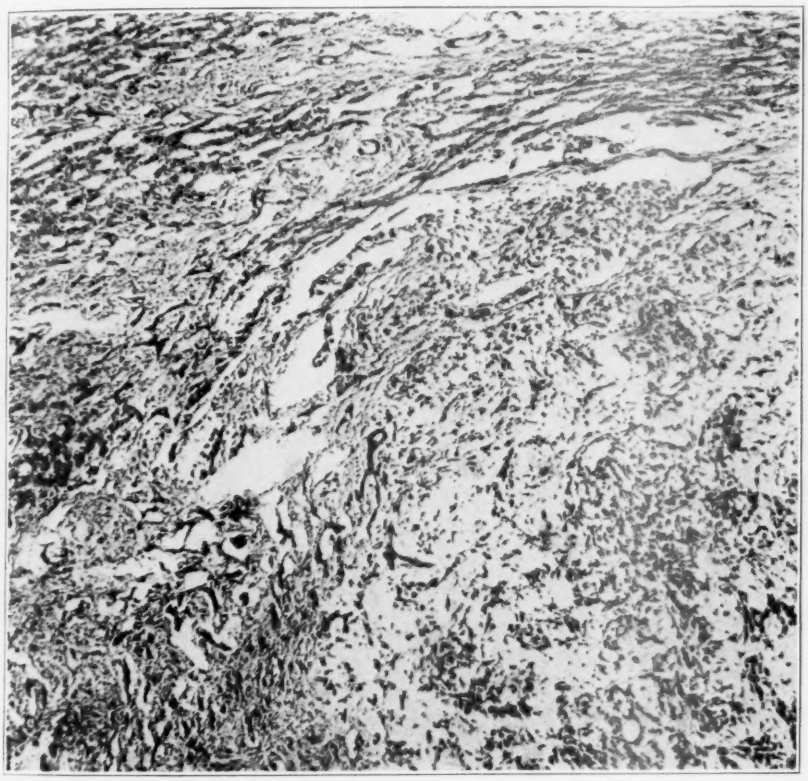

Fig. 3 (case 1).—Section through the liver, showing nests of tumor cells loosely distributed. The adjacent liver cords are flat and the sinusoids are slitlike. (Hematoxylin and eosin stain; × 50.)

areas the central veins and sinusoids were distended with red blood cells. The liver cells were arranged in well formed lobules; the cytoplasms contained golden yellow granules, and the nuclei were vesicular. The periportal connective tissue was increased and was infiltrated with small round cells and large mononuclear cells (figs. 3 and 4). The remaining organs showed nothing unusual. The lymph nodes showed no metastases.

Anatomic Diagnosis.—The diagnosis was carcinoma of the liver (hepatoma) with tumor emboli in the lungs, and hemoperitoneum.

CASE 2.—A 16 month old boy was admitted to the Jewish Hospital with vomiting of two months' duration and enlargement of the abdomen of two weeks' duration. He had been in good health until two months previously, when he began to vomit between meals. The vomiting was projectile and consisted of partly digested food. About two weeks before the infant was admitted, the mother noticed that his abdomen was firm and appeared enlarged. There had been some loss of weight since the onset of symptoms. The night before admission the child awoke crying and seemed to have a good deal of pain.

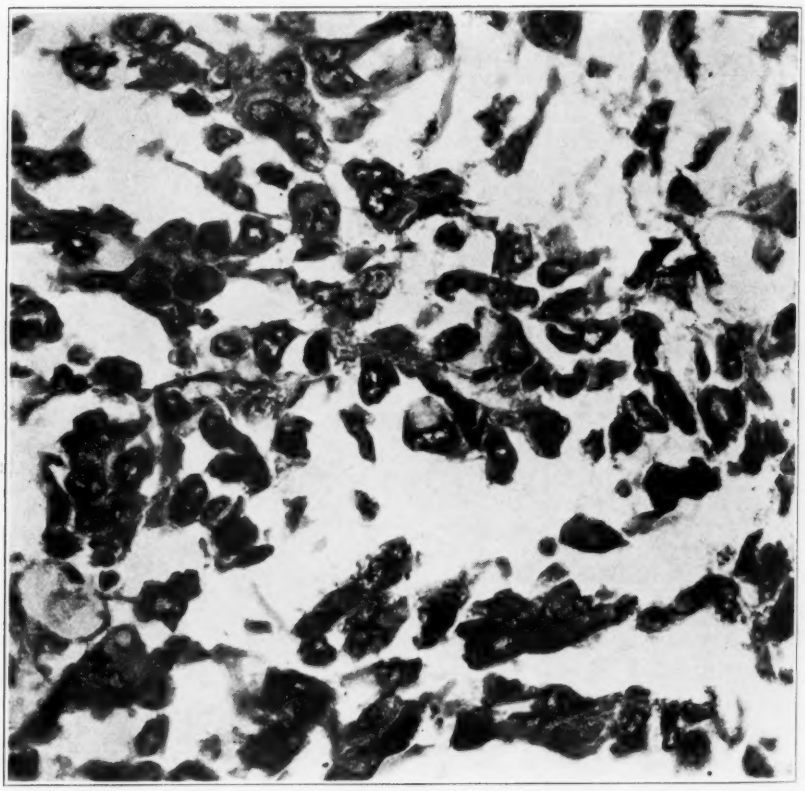

Fig. 4 (case 1).—Section through the tumor, showing polyhedral and spindle-shaped cells within a scanty stroma. Note the variation in size, shape and staining of the nuclei, and the presence of mitotic figures. (Hematoxylin and eosin stain; × 750.)

On admission he appeared well developed. He was somewhat irritable. The temperature was 100 F. There was no jaundice. The head, neck and chest presented no unusual findings. The abdomen was enlarged, and the superficial veins were prominent. There was a firm nodular mass in the right upper quadrant extending downward to the right iliac fossa and about 1½ inches (3.8 cm.) to the left of the midline. The spleen was not palpable. The clinical impression was hypernephroma, retroperitoneal sarcoma or neuroblastoma. An exploratory laparotomy revealed a large tumor of the liver, with several friable nodular masses on the

anterior aspect of the right lobe. The peritoneal cavity was filled with bloody fluid, which came from a perforation in the lower portion of the tumor. The patient did not rally from the operation and died soon afterward. The postoperative diagnosis was carcinoma of the liver, with hemoperitoneum.

Postmortem Observations.—At necropsy the skin was pale but not icteric. The head, neck and chest were normal. The peritoneal cavity was filled with bloody fluid. The lymph nodes were not enlarged. The pleural and pericardial cavities were not remarkable.

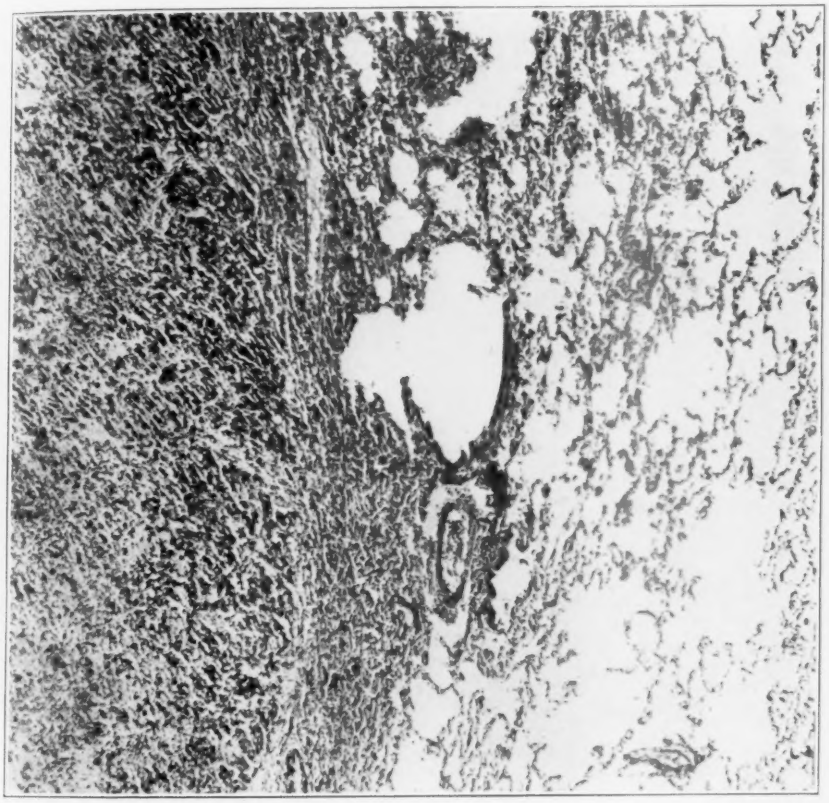

Fig. 5 (case 2).—Section of the lung, showing that a large portion of the parenchyma has been replaced by islands of tumor tissue. (Hematoxylin and eosin stain; × 80.)

The lungs were doughy and grayish white. Over the pleural surface there were numerous red elevated nodules, up to 0.5 cm. in diameter. These were soft and umbilicated. The cut surfaces were pale red and revealed fairly well circumscribed gray and red granular areas. The trachea and bronchi were not abnormal.

The liver weighed 1,240 Gm. The greater part of the right lobe was occupied by a soft, nodular, gray and red friable mass. The left lobe was smooth and pale brownish red. On section it was seen that a large portion of the liver was replaced by fairly well circumscribed nodules, the surfaces of which were grayish red and granular. Many large, distended blood spaces and bands of gray and

red were noted. The intervening and adjacent liver parenchyma appeared compressed, and the usual landmarks were indistinct. The portal veins in the region of the tumor tissue were thrombosed. The remaining organs presented nothing unusual. The lymph nodes showed no metastases.

Microscopic Observations.—The alveolar spaces of the lungs were broad and clear. The interalveolar septums were thin, and the capillaries were filled with red blood cells. In some areas the septums were interrupted, forming large irregular air spaces. Elsewhere the septums were close together, and the alveolar

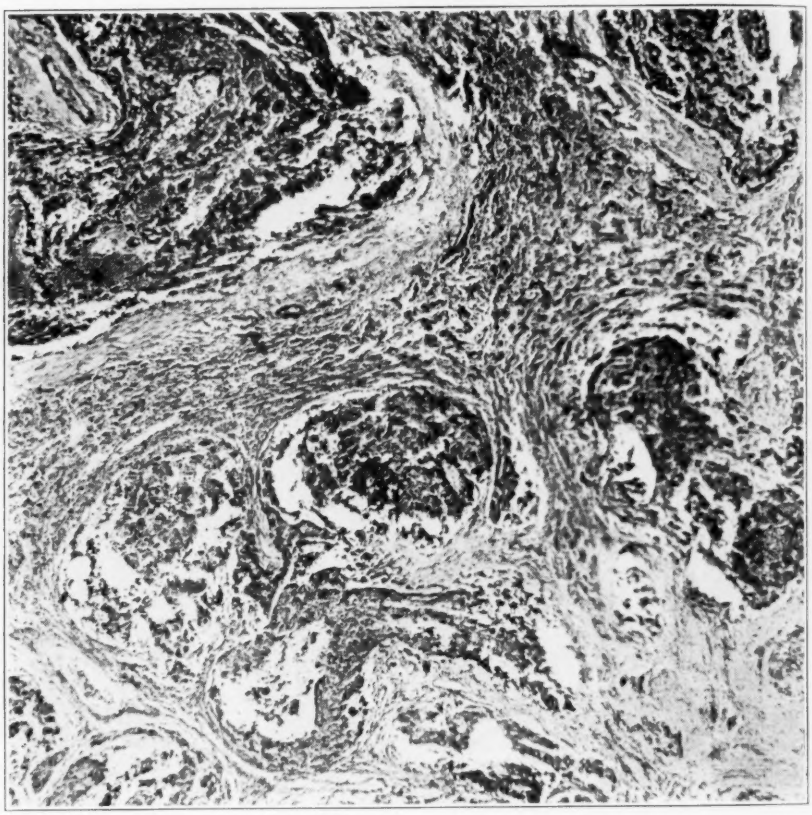

Fig. 6 (case 2).—Section through the liver, showing nests of tumor cells and intervening compressed liver cords. Note the blood spaces in the tumor and the scanty stroma. (Hematoxylin and eosin stain; × 60.)

spaces were slitlike. The bronchi and the blood vessels were normal. A large portion of lung tissue close to the pleura was replaced by sheets of tumor cells like those to be described in the liver. In the tumor tissue many capillaries were distended with red blood cells (fig. 5).

Large areas of liver parenchyma were replaced by broad sheets and nests of tumor cells. In many areas these cells were arranged in cords; here the cells varied in size, shape and staining characteristics. In places, nests of tumor cells surrounded large spaces which were filled with red blood cells or with pink-

staining granular material. In other areas, tumor cells were loosely distributed and mingled with intact red blood cells. Most of the tumor cells were polygonal, while the form of others varied from spindle shaped to bizarre. The nuclei were oval, vesicular and pale staining, with fine chromatin material and thin nuclear membranes. Other nuclei were pyknotic and hyperchromatic. Many mitotic figures were noted. The cytoplasms were abundant, pink staining and homogeneous; the cytoplasms of the spindle-shaped cells were scanty and showed delicate processes, which formed a loose, interlacing fibrillar network. No biliary

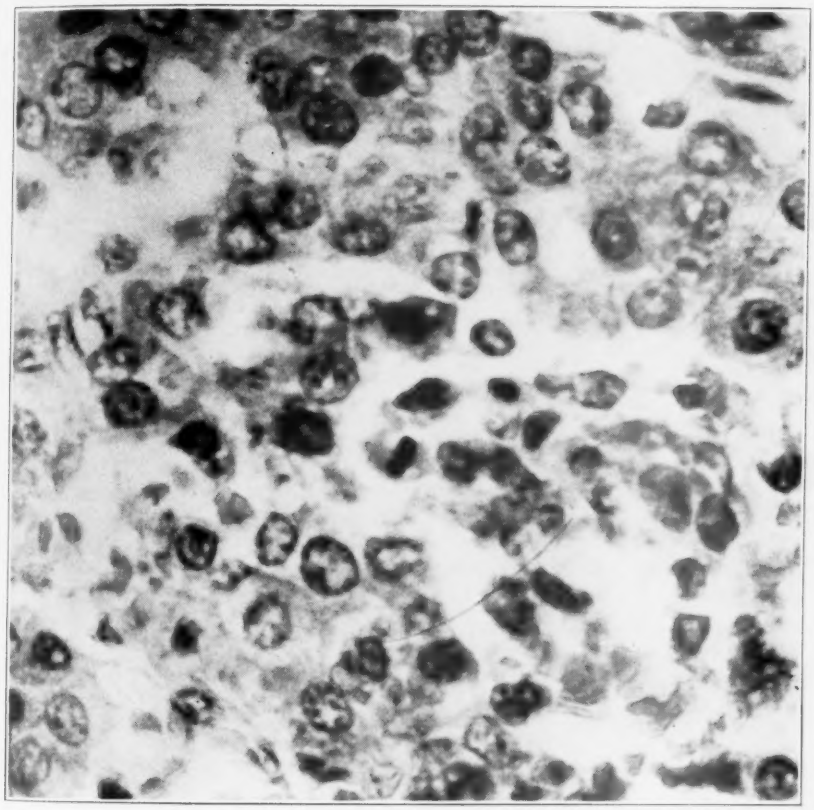

Fig. 7 (case 2).—Section through the tumor, showing the loose arrangement of cells. Note the variation in the nuclei and the presence of many mitotic figures. (Hematoxylin and eosin stain; × 1,000.)

secretion was noted. The stroma was scanty and in places was made up of a loose arrangement of pale-staining spindle-shaped cells. Broad, dense bands of connective tissue extended throughout, dividing groups of tumor cells into well circumscribed areas. Between nests of tumor cells, broad bands of thin liver cords were noted; the liver cells were poorly stained and their nuclei were pyknotic; the sinusoids were slitlike and contained few red blood cells. In some areas these cells varied in size, shape and staining characteristics, and their appearance suggested a transformation into tumor tissue. Occasional periportal

areas contained well preserved bile ducts and a few small round cells; the portal veins contained loose tumor cells. At some distance from the tumor the lobular arrangement of the hepatic parenchyma was indistinct. The liver cords were interrupted, and the cells were vacuolated. The central veins and sinusoids contained red blood cells and small round cells. Tumor cells were visible within the portal veins (figs. 6, 7 and 8).

The remaining organs appeared normal. The lymph nodes showed no metastases.

Anatomic Diagnosis.—The diagnosis was carcinoma of the liver (hepatoma) with metastases to the lungs, and hemoperitoneum.

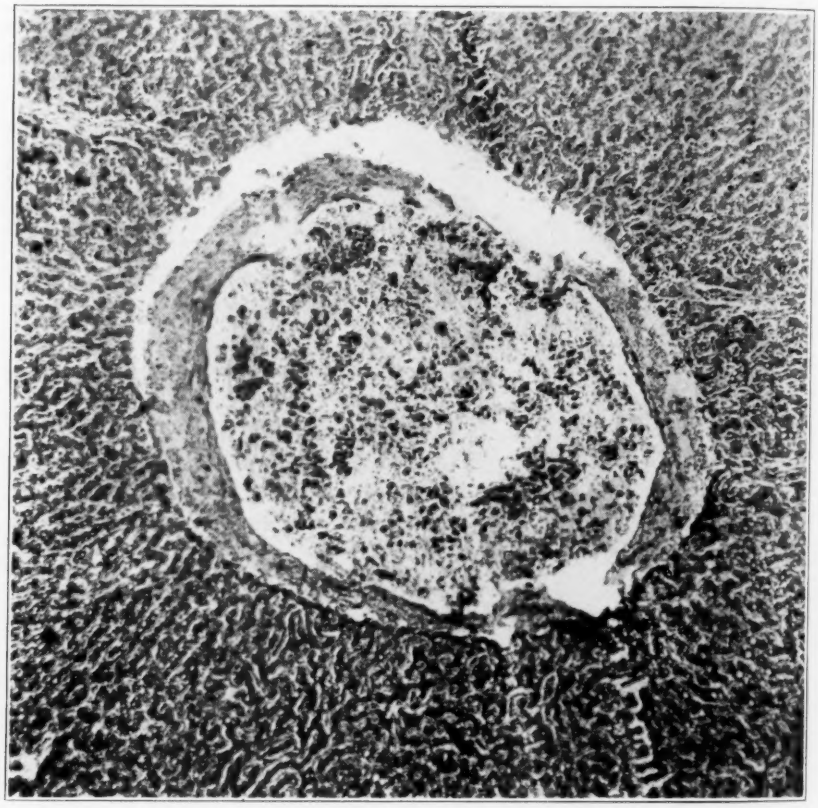

Fig. 8 (case 2).—Section through the liver at some distance from the tumor. Note the tumor cells within the portal vein. The adjacent lobules show no evidence of neoplastic change. Hematoxylin and eosin stain; × 60.)

COMMENT

Age.—Primary carcinoma of the liver has been reported at birth (Noeggerath [26]); so it is likely that this tumor can develop during fetal

26. Noeggerath, E.: Geburtshindernis in Folge eines Lebercarcinoms beim Neugebornen, Deutsche Klin. **6**:496, 1854.

life. In the 77 cases tabulated here, 41 or 53.2 per cent of the neoplasms occurred before the age of 2 years.

Sex.—There were 51 boys (68 per cent) and 24 girls (32 per cent). The sex was not given in 2 cases.

Etiology.—The question of the etiology of primary carcinoma of the liver in children is still unanswered. According to Ewing,[27] "congenital maladjustment of groups of liver cells predisposing them to tumor growth seems to be a rare factor in adults, while possibly of more importance in infants and in solitary tumors." The relation of cirrhosis to carcinoma in adults has been the subject of many reports. According to Eggel [8] it is the chief predisposing factor, occurring in about 85 per cent of hematomas. In the reports reviewed here, cirrhosis was mentioned only twice, and in both instances it occurred in older children. The occurrence of the tumor at birth suggests that the essential cause is related to a congenital factor, at least in some cases.

TABLE 2.—*Frequency of Primary Carcinoma According to Age*

Age	No. of Cases	Age	No. of Cases
Birth to 1 month	2	7 to 8 years	1
2 to 6 months	8	8 to 9 years	1
6 months to 1 year	18	9 to 10 years	4
1 to 2 years	13	10 to 11 years	1
2 to 3 years	0	11 to 12 years	4
3 to 4 years	3	12 to 13 years	3
4 to 5 years	1	13 to 14 years	5
5 to 6 years	4	14 to 15 years	4
6 to 7 years	3	15 to 16 years	2

Symptoms.—The symptomatology is not characteristic and depends to a large extent on the mechanical effects of the growth in the liver. Pain occurs frequently; it is usually dull and is referred to the region of the liver. Disturbances in nutrition, anorexia, anemia and loss of weight are often associated with the neoplastic growth. In some cases the child appears well nourished. Jaundice and ascites are uncommon in cases in which the condition is uncomplicated. Jaundice occurred in only 6.5 per cent of the cases, and in these there was mechanical obstruction of the biliary ducts. Its absence therefore cannot be regarded as an important indication that this condition can be excluded.

Clinical Course.—The onset of symptoms was sometimes sudden, with pain, anorexia and swelling of the abdomen. More frequently, an insidious enlargement of the abdomen not associated with any complaints continued for many weeks. The average duration of life following the appearance of symptoms was four months. No recovery was reported. Surgical intervention was employed in 4 cases, but it was not successful.

27. Ewing, J.: Neoplastic Diseases, ed. 3, Philadelphia, W. B. Saunders Company, 1928.

Pathologic Classification.—In Hanot and Gilbert's [7] series 3 gross types were distinguished: *cancer massif, cancer nodulaire* and *cancer avec cirrhose,* with a further, microscopic, classification into *cancer alvéolaire* and *cancer trabéculaire.* Eggel,[8] in examining primary carcinoma of the liver in 163 patients of all ages, came to the conclusion that this classification was not satisfactory and employed the terms massive, nodular and diffuse. The massive type of tumor, which he encountered in 23 per cent of the cases, was large; the surface was usually smooth, with occasional projecting growths and adhesions between the liver and the adjacent organs. The growth was localized and usually began in the right lobe. The diffuse type of tumor (12 per cent) was diffused throughout the liver, which was enlarged and soft. It was slow growing and tended to be associated with cirrhosis. The nodular type of growth (64 per cent) appeared multiple (although it may have started from a single focus), grew rapidly and was prone to degenerate and become necrotic. Yamagiwa [12] dispensed with Eggel's classification and employed the simpler terms hepatoma, or carcinoma of the liver cell type, and cholangioma, or carcinoma of the bile duct cell type. Although clinically it is impossible to differentiate these two types, they can usually be identified histopathologically. In hepatoma the cells are arranged in columns closely resembling the normal liver structure and often show an attempt at formation of atypical lobules. Biliary secretion can be seen sometimes in the primary and less often in the secondary growth. The characteristic stroma is composed of delicate capillaries, although at the periphery it is chiefly fibrous and is an exaggeration of the normal portal stroma. In cholangioma the cells show an attempt at formation of tubules and atypical alveolar spaces, which in many instances resemble the normal biliary ducts. There is no biliary secretion. The stroma is predominantly fibrous, and capillary formation is scant. In a few cases differentiation is difficult, for, as Ewing [27] says, "the cells may be so far removed from their usual morphology that some doubt must always remain concerning their origin."

Biliary secretion in hepatoma was not encountered frequently. In Eggel's cases only 15 patients showed biliary secretion in the primary tumor, and of these only 3 showed production of bile in the metastases. In the cases reported by Mair [28] and Wegelin [29] biliary secretion was noticed in tumor cells.

The origin of the primary carcinoma has been discussed at great length. Advocates of the unicentric theory believe that the tumor begins

28. Mair, W.: A Case of Primary Carcinoma in Boy Aged Six Years, J. Path. & Bact. **16**:389, 1911-1912.

29. Wegelin, K.: Adenocarcinoma and Adenoma of the Liver, Virchows Arch. f. path. Anat. **179**:95, 1905.

as one large nodule and assert that, in spite of the multiplicity of the metastases, it is possible to trace the tumor back to its single point of origin. Most observers believe that the unicentric is more reasonable than the multicentric theory of origin, although an apparently multicentric condition soon prevails because of the prompt intrahepatic dissemination through the venous channels of the liver.

Secondary Growths.—Metastases outside the liver occurred in 27.2 per cent of the cases of children reviewed here (22 instances) as compared with 66 per cent of Eggel's cases of adults. Intrahepatic extension

TABLE 3.—*Classification of Cases*

Type of Growth	No. of Cases
Hepatoma	
Primary carcinoma (liver cell)	30
Adenocarcinoma (liver cell)	15
Carcinoma hepatocellulare solidum	2
Medullary carcinoma	5
	52
Cholangioma	
Primary carcinoma	3
Unclassified	
Primary carcinoma	22

TABLE 4.—*Location and Incidence of Secondary Growths*

Extension into portal and hepatic veins	9
Extension into inferior vena cava	4
Metastases to:	
Lymph nodes	9
Lungs	16
Pleura	1
Pericardium	1
Spleen	1
Pancreas	1

was frequent because the early invasion of the capillaries brings about prompt dissemination of the tumor throughout the liver.

Differential Diagnosis.—The differential diagnosis of primary carcinoma of the liver in childhood resolves itself into the consideration of conditions which bring about enlargement of the liver. Carcinoma of the liver is usually a rapidly progressive disease accompanied by emaciation, cachexia and anemia. Various other neoplasms can occur, such as sarcoma or secondary growth from a neuroblastoma, but these are less common. Adenomas, mixed tumors and Hodgkin's disease have been described. For all these, however, as for various vascular abnormalities and congenital cysts, the diagnosis in most instances rests with the gross or microscopic examination. Leukemic infiltration may lead to hepatomegaly without symptoms, and the diagnosis is often made by examination of the blood. Many inflammatory (toxic) enlargements of

the liver are encountered in childhood, and one must often depend for the diagnosis on the history, symptoms and laboratory findings. Abscess of the liver may arise from infection of the umbilicus. Single abscesses are often due to Endamoeba histolytica, and the diagnosis is difficult. Parasitic cysts, usually due to Taenia echinococcus, are also encountered. Casoni's reaction, fixation of the complement and the precipitin reaction of the patient's blood are of some help in this instance. The enlargement of the liver in syphilis develops slowly, and reliance is placed on the history, symptoms and serologic findings.

SUMMARY AND CONCLUSIONS

Two cases are reported of primary carcinoma of the liver (hepatoma) with metastases to the lungs, in a 4 month old girl and in a 16 month old boy.

A review of the literature disclosed 75 proved cases in children up to 16 years of age.

Of these cases, 53.2 per cent occurred in infants under the age of 2 years. Of the patients, 68 per cent were boys and 32 per cent girls.

The symptomatology was not characteristic and depended to a large extent on the mechanical effects produced by the growth of the liver. The average duration following the onset of symptoms was four months. Recovery was not reported.

The pathologic classification of hepatoma and cholangioma is recommended. There were 52 cases of hepatoma, 3 cases of cholangioma and 22 unclassified cases.

Metastases occurred in 27.2 per cent of the cases.

News and Comment

GENERAL

Medal Presented to Dr. Schick.—Dr. Bela Schick was given a gold medal by the New York Academy of Medicine on Thursday, March 3, the twenty-fifth anniversary of the publication of his work on immunization of diphtheria. The medal was presented by Dr. James Alexander Miller, president of the academy.

American Board of Pediatrics.—Examinations will be held by the American Board of Pediatrics in Detroit, at the time of the meeting of Region III of the American Academy of Pediatrics, October 27, 28 and 29 (definite date not set); in Rochester, N. Y., at the time of the meeting of Region I of the American Academy of Pediatrics, November 11 and 12 (definite date not set), and in Oklahoma City on Nov. 15, 1938, preceding the joint meeting of Region II of the American Academy of Pediatrics with the Southern Medical Association.

UNIVERSITY NEWS

The University of Iowa will give summer courses in child development and parent education from June 13 to August 5.

SOCIETY NEWS

Chairman of the Federation of American Societies for Experimental Biology.—Dr. Glenn E. Cullen, Department of Pediatrics of the University of Cincinnati Medical School, will be chairman of the Federation of American Societies for Experimental Biology during the coming year, after his election as president of the American Society of Biological Chemists.

DEATHS

Dr. Wilhelm Knoepfelmacher, aged 72 years, is reported to have committed suicide in Vienna recently. Dr. Knoepfelmacher was well known by American students in Vienna, and his courses have been popular for more than a generation.

Dr. W. O. Colburn, a well known pediatrician of Lincoln, Neb., died on April 11, of coronary thrombosis.

Obituaries

LOUIS CLAUSEN SCHROEDER, M.D.
1881–1938

The death of Louis Clausen Schroeder on February 25, at the age of 56 years, brought to an untimely end the career of a distinguished and productive pediatrician.

Dr. Schroeder's premedical education was acquired solely through his own efforts and by virtue of his determination and indomitable strength of character. He graduated in medicine at the College of Physicians and Surgeons of New York in 1911; after graduation he received training at Bellevue Hospital, where he was intern in the department of internal medicine and intern and later resident in the department of pediatrics. He remained on the visiting staff of Bellevue Hospital until 1919, when he became attending pediatrician to the New York Nursery and Child's Hospital and later director of the pediatric service, in which he remained until the hospital closed in 1933. At the time of his death he was attending pediatrician to the New York Hospital. He taught in the department of pediatrics at the College of Physicians and Surgeons and later was assistant professor of clinical pediatrics at Cornell University Medical School, occupying the position until his death. At the last-mentioned institution he was acting professor of pediatrics from 1921 until 1923.

Characteristics which distinguished Dr. Schroeder and shaped his career were eagerness for knowledge, energy, honesty and high ideals. He was essentially realistic, and, though not lacking in appreciation and knowledge of the scientific aspects of medicine, he was devoted to the art of medicine in all its phases: educational, preventive and curative. Dr. Schroeder was an excellent speaker and writer. He was clear and forceful and presented his ideas in well ordered sequence. He was an effective teacher and was greatly admired by students. With them he dwelt largely on the practical aspects of disease, its diagnosis and treatment.

He had outstanding executive ability, which found expression in reorganization of the outpatient department of the New York Nursery and Child's Hospital and in his work in the founding and organization of the American Academy of Pediatrics. He gave considerable time to this society and was regional chairman at the time of his death. He was also an active member of the American Pediatric Society.

Dr. Schroeder had great affection for children and visualized clearly their problems, both mental and physical. This was undoubtedly largely responsible for his great interest in child hygiene and welfare work, to which he made large contributions. On these and on closely related subjects he wrote a book and many papers.

As would be expected from his attainments, Dr. Schroeder was a successful practitioner. Notwithstanding the exactions of private practice, however, he always found time for hospital work, teaching and interests which extended beyond medicine. He was an omnivorous reader on many subjects, had a deep interest in music and did sculpture of distinctive merit.

Despite a long-standing illness attended by great physical discomfort, Dr. Schroeder continued his work almost to the end. He was always fun loving and cheerful, and his kindness and sympathy endeared him to the many friends who mourn his loss.

His accomplishments have made an imprint on American pediatrics which will long endure.

O. M. S.

Abstracts from Current Literature

Anatomy and Physiology

ROLE OF THE LIVER AS THE COMMISSARIAT OF THE BODY. F. C. MANN, Am. J. Digest. Dis. & Nutrition **4**:355 (Aug.) 1937.

This is the nineteenth Mellon lecture. It is excellent and should be read by every physician. It presents evidence to indicate the mechanism by which the liver maintains a constant supply of utilizable food materials for the tissues of the body. The importance of hepatic activity must be considered in every phase of metabolism. Present knowledge is only a small percentage of what must be learned before all the intricate processes involved are fully understood.

MORRISON, Savannah, Ga.

BREATHING OF AMNIOTIC FLUID AS A NORMAL FUNCTION OF FETAL RESPIRATION. F. F. SNYDER and M. ROSENFELD, Proc. Soc. Exper. Biol. & Med. **36**:45 (Feb.) 1937.

India ink was added to the amniotic fluid of rabbits. In breathing fetuses the lungs were blackened, while in litter mate controls in which the breathing had been suppressed by injection of pentobarbital sodium the lungs were normal. Microscopic examination disclosed carbon particles in the lungs of the former but not in those of the latter. The lungs were darker in those which showed the greater respiratory activity. It is clear that amniotic fluid normally occupies the alveoli of the fetal lung.

HANSEN, Minneapolis.

A CONTRIBUTION TO THE KNOWLEDGE CONCERNING THE SKULLS OF CHINESE CHILDREN. H. SAKAI, J. Orient. Med. **25**:23 (July) 1936.

Measurements were made on the skulls of twenty-five Chinese children, varying in age from a 9 month fetus to a 12 year old child. The article should be consulted for specific measurements and indexes.

LESLIE, Evanston, Ill.

Biochemistry; Bacteriology, and Pathology

METHOD OF TRANSMISSION OF IMMUNITY TO EQUINE ENCEPHALOMYELITIC VIRUS IN THE GUINEA PIG. B. F. HOWITT, J. Infect. Dis. **61**:88 (July-Aug.) 1937.

Young guinea pigs born of mothers immune respectively to eastern and western American strains of equine encephalomyelitic virus are themselves immune usually for at least a month after birth whether weaned or unweaned. Young guinea pigs born of mothers immune to a Russian Moscow no. 2 strain, however, were found lacking in the acquired immunity.

There is no change in the immunity of the young born of immune parents (American strains) on transference to normal mothers, even though the transfer occurs on the day of birth. Inversely, no normal young guinea pigs were immune after residing with immune mothers for at least a month.

Adult and fetal serums of immune pregnant guinea pigs contain substances neutralizing eastern and western American and Russian strains of virus, respectively, while positive neutralization is given by the amniotic fluids from animals

immune to the eastern and to the Russian strains but not by the fluids from animals immune to the western types.

It was found that the virus penetrates the placental tissue of guinea pigs inoculated with the American varieties of virus but not that of animals inoculated with the Russian, its presence in the fetus depending on the element of time. The infectiousness and general dissemination are greater for the eastern than for the western American type.

From the data presented it seems probable that immunity to the American strains is transferred to the young guinea pigs by way of the placenta rather than in the milk.

TOOMEY, Cleveland.

THE IMMUNOLOGICAL REACTIONS OF THE FILTERABLE VIRUSES. F. M. BURNET, E. V. KEOGH and D. LUSH, Australian J. Exper. Biol. & M. Sc. **15**:231 (Sept.) 1937.

The authors present a monograph of 138 pages on the phenomena resulting from the interaction of viruses and immune serum and on the theoretic bases of these phenomena. The final chapter is devoted to the principles of active immunization against virus infections.

TENNEY, Madison, Wis.

INFLUENCE OF THALLIUM IN THERAPEUTIC AND TOXIC DOSES ON COMPLEMENTARY AND OPSONIC POWER OF THE BLOOD SERUM, ON THE BACTERICIDAL POWER OF THE WHOLE BLOOD AND ON THE VELOCITY OF THE SEDIMENTATION OF THE BLOOD CORPUSCLES. B. VASILE, G. GRANOZZI and F. PECORELLA, Pediatria **45**:193 (March) 1937.

The authors have carried out experiments on the behavior of the complementary and the opsonic power of the blood serum, on the bactericidal power of whole blood and on the sedimentation time of the red corpuscles of babies during the administration of therapeutic doses of thallium (metal). They noted an increase in the opsonic and in the complementary power and a diminution in the sedimentation time. There was no modification of the bactericidal power of whole blood.

To explain the mechanism through which thallium might cause such modifications in the immunitary processes the authors have experimented with the eventual influences of thallium in vitro on the same processes and have been able to exclude any direct influence of the drug itself.

In order to interpret their results, they will submit another report covering the second part of their research on thallium-intoxicated rabbits, in which they will try to arrive at some definite conclusions.

PALMIERI, Brooklyn.

Metabolism; Infant Feeding; Milk and Other Foods

COMPARATIVE EXPERIMENTS WITH CANNED, HOME COOKED, AND RAW FOOD DIETS. E. F. KOHMAN, W. H. EDDY, MARY E. WHITE and N. H. SANBORN, J. Nutrition **14**:9 (July) 1937.

Experiments were made to obtain additional information concerning the relative merits of raw and of cooked foods. Three series of experiments with animals (rats), one conducted over a number of successive generations, a second limited to one generation and a third limited to the period of rapid growth after weaning, are presented. Experimental conditions were planned to conform as nearly as possible to the usual conditions under which food is consumed.

From the evidence available in the experiments, the authors conclude that "there is no inherent virtue in 'rawness.'" They believe that cooking has beneficial effects on the physical structure and texture of foods and that it inactivates

certain plant enzymes which in many instances are detrimental to the handling of foods by the digestive tract. They found that canned foods were an efficient source of calcium and that inherent nutrient qualities are efficiently preserved.

MUNNS, Winnetka, Ill.

PLASMA PHOSPHATASE IN DISEASE: A REVIEW. NOAH MORRIS and OLIVE D. PEDAN, Quart. J. Med. **6**:211 (April) 1937.

The authors review the literature on the phosphatase content of the plasma and present a list of eighty-six references. The subject is discussed in relation to healthy persons as well as to those with pathologic conditions, which are grouped as osseous and nonosseous conditions and miscellaneous diseases. The review appears to be fairly comprehensive.

BRADFORD, Rochester, N. Y.

INDICATIONS FOR ACIDIFIED MILK. P. ROHMER and R. CHAPELO, Bull. Soc. de pédiat. de Paris **34**:470 (July) 1936.

Fifty-five infants were fed a mixture of acidified dried milk powder. The group included newborn, premature, athreptic and older infants, as well as some infants with diarrhea and some who suffered from vomiting. The results were uniformly good except in those who were vomiting, whose condition did not improve until the mixture was withdrawn and another feeding substituted. One child with celiac disease did well when fed the mixture. The authors do not think it necessary to feed all normal infants acidified milk instead of the simple milk mixtures which are effective in most cases; this feeding will usually prove satisfactory in cases in which concentrated formulas of high caloric value and easy digestibility are required.

BENJAMIN, Montreal, Canada.

ACTION OF THYROID HORMONE ON EXCESSIVE FAT IN MOTHER'S MILK. M. ANTONINI, Lattante **8**:397 (June) 1937.

Thyroid gland in a dose of from 0.1 to 0.2 Gm. daily was given to ten mothers who were excreting an excessive amount of fat in their milk. Nine of these mothers showed a marked diminution in the percentage of fat—from between 4.5 and 7 per cent to between 1.9 and 4.4 per cent. The nursing infants in several instances had been suffering from intolerance of food and from diarrhea. This lowering of the fat content of the mothers' milk was believed responsible for an improvement in the condition of the infants.

HIGGINS, Boston.

PECULIARITIES OF THE DISTRIBUTION OF SALT AND WATER IN THE INFANT. Ö. KERPEL-FRONIUS, Ztschr. f. Kinderh. **58**:726, 1937.

Extracellular and intracellular fluids differ in their inorganic constituents in that the former contain sodium chloride and sodium bicarbonate predominantly while the latter contain no sodium or chloride but do contain potassium and magnesium. Intracellular fluid is rather firmly bound. Extracellular fluid, on the other hand, is mobile. It interchanges readily with the blood plasma, which it resembles closely in composition. The values obtained for the amount of fluid in the tissues by determining its chlorine and its potassium content correspond closely to values obtained by exsiccation of tissues. A computation of the extracellular and intracellular distribution of fluid may be made from a determination of the sodium, the chlorine and the phosphorus content. During growth a progressive decrease in the water content of the body occurs. This decrease is practically entirely at the expense of extracellular fluid. The abundance of extracellular fluid in the infant corresponds to edema in the adult and may be significant

as an indication of hydrolability during infancy. Kerpel-Fronius discusses his results for muscle, for skin, for brain and for the body in general separately. He describes his technic.

SIEMSEN, Chicago.

SIGNIFICANCE OF COPPER CONTENT OF HUMAN MILK. ALOIS VELICH and PETR ŠEVČENKO, Časop. lék. česk. **75**:41 (Jan. 10) 1936.

Possibly the reason for the increased incidence of anemia in artificially fed newborn infants is the fact that human milk contains more copper than cows' milk. Using the polarigraphic and microanalytic method of Heyrovsky, the authors found that the copper content is highest in colostrum just before parturition. Prenatal colostrum contains 0.00078 per cent and postpartum colostrum 0.00062 per cent, while the maximum for breast milk is 0.00007 per cent. The urine of the newborn and the meconium contain 0.00038 per cent copper. The copper content of breast milk varies so greatly even among women on the same dietary regimen and its ratio in colostrum and in milk is so variable that the copper content cannot be used with any accuracy in the estimation of parturition or of postnatal age. The variation in copper content is so great in the milk of different women that more intensive work will have to be done before a definite relation between the copper content of breast milk and anemia can be formulated.

STULIK, Chicago.

WEANING AND THE WATER CONTENT OF THE BLOOD. T. RYO, Keijo J. Med. **7**:1 (May 15) 1936.

The author has studied the water content of the blood in infants of various ages. He finds that this increases gradually up to the end of the first year and then decreases. He associates the decrease in water content with weaning.

LESLIE, Evanston, Ill.

CHANGES IN THE HYDROGEN ION CONCENTRATION OF BODY FLUIDS FOLLOWING IRRADIATION. C. ONO, Orient. J. Dis. Infants **21**:373 (May) 1937.

Roentgen irradiation (252 r) of abdominal and thoracic areas definitely decreased the p_H values of the fluids of both the muscle and the subcutaneous tissue, while that of venous blood suffered slight change. This decrease in the p_H values of the body fluids is due to the acidosis produced by the decomposition of proteins. The return to the normal value is gradual, requiring one or two days.

KATO, Chicago.

Vitamins; Avitaminoses

VITAMIN A ACTIVITY OF BUTTERS DETERMINED BY VARIOUS METHODS. M. ETHELBURG LEUSCHEN, B. L. KUNERTH, M. M. KRAMER and W. H. RIDDELL, J. Nutrition **14**:247 (Sept.) 1937.

The vitamin A value was determined for a commercial winter butter and for butters made from composite twenty-four hour samples of the secretions of the first, the fifth and the thirtieth day of lactation of three individual cows. The vitamin A content was estimated by spectrophotometry and by the quartz spectrographic and the single feeding method of biologic assay.

The carotene content of colostric butters was superior to that of other butters, and butter fats produced on the fifth day of lactation contained from one-fourth to one-tenth the amount of vitamin A per gram produced by the same cow on the first day. Butter fats produced on the thirtieth day of lactation showed further

decreases in the vitamin A content. Commercial butter had a vitamin A content similar to that of butter made later in the period of lactation. The carotene content of commercial butter was similar to that of the thirty day samples.

MUNNS, Winnetka, Ill.

VITAMIN DEFICIENCY DISEASES: THEIR DIAGNOSIS AND TREATMENT. D. L. WILBUR, M. Clin. North America **12**:737 (May) 1937.

While the gross manifestations of vitamin deficiency are now easily recognized, clinical and experimental evidence of the existence of states of partial deficiency, elusive in their symptomatology, is gradually accumulating. Two factors are most concerned in the production of these deficiency states in this country, where the foods consumed are rarely inadequate in quantity, i. e., destruction of vitamins in processing and changes in the gastro-intestinal tract which lead to inadequate absorption even though the diet contains a sufficient supply of essential substances.

"Vitamin A is probably a catalyst in its chemical action and physiologically it is essential for the maintenance of the integrity and normal state of all epithelial tissues." In deficiency, these tissues lose their normal appearance, and thickening or keratinization, followed by secondary infection, results. To these epithelial changes may be attributed the ocular symptoms and cutaneous lesions occurring in vitamin A deficiency. Contrary to popular opinion, vitamin A is not an anti-infective agent.

Vitamin B, while apparently a catalyst chemically, is physiologically an essential factor in the metabolism of carbohydrates, probably having some part in the oxidation of lactic acid and pyruvic acid. Deficiency is manifest clinically by such nervous symptoms as peripheral neuritis, paresthesias of the extremities and tenderness of the muscles, with weakness or paralysis. Certain intestinal disturbances, especially anorexia, may result from dietary deficiency of this vitamin. Therapeutically, crystalline B_1 does not seem to represent all the factors of the vitamin. Brewers' yeast, however, apparently contains an essential substance not present in crystalline and concentrated forms.

Vitamin C is a powerful reducing substance and physiologically is essential in the formation and maintenance, in a normal state, of intercellular substance, particularly of the blood vessels, dental forming organs and connective tissue.

Vitamin D plays an essential part in the metabolism of calcium and phosphorus. Hence its use in the prevention and cure of rickets, in the treatment of certain bone diseases and tetany, and in the promotion of normal dentition is on a sound physiologic basis.

Vitamin B_2 or G is the heat-stable or antidermatitic factor of the original water-soluble vitamin B. The former is also apparently composed of two fractions, neither one of which alone possesses the growth promoting action which together they manifest. Singly or together, the two factors are essential for normal functioning of the skin, nervous system and gastro-intestinal tract. The richest sources of vitamin G are fresh leafy vegetables, cream, milk, eggs, beef, potatoes, citrous fruits and especially yeast extracts and liver extract.

EUGENE SMITH, Ogden, Utah.

DIET IN RELATION TO HEALTH; DARK ADAPTATION AS INDEX OF VITAMIN A INTAKE. J. R. MUTCH and H. D. GRIFFITH, Brit. M. J. **2**:565 (Sept. 18) 1937.

This paper does not lend itself to abstracting. The authors' summary follows: "The estimation of power of dark adaptation by means of Edmund's hemeralopia test type and Tscherning photometric glass is described and preliminary results presented.

"A limit is shown below which all subjects react with improved adaptation to administration of vitamin A. Those whose first performance is above this limit give no response to vitamin A.

"The test is sufficiently simple to be applied to intelligent children of 6 years, so short that it is suitable for serial examinations, and the results are unaffected by practice."

ROYSTER, University, Va.

VITAMIN C AND INFECTION: EXCRETION OF VITAMIN C IN OSTEOMYELITIS. M. A. ABASY, L. J. HARRIS and N. G. HILL, Lancet **2**:177 (July 24) 1937.

In osteomyelitis, as in other infective conditions, the rate of excretion of vitamin C in the urine is diminished and the response to a test dose lowered, which is indicative of increased usage of the vitamin during the progress of the infection.

LANGMANN, New York.

VITAMIN C AND INFECTION: EXCRETION OF VITAMIN C IN PULMONARY TUBERCULOSIS AND IN RHEUMATOID ARTHRITIS. M. A. ABASY, L. J. HARRIS and P. ELLMAN, Lancet **2**:181 (July 24) 1937.

In patients with pulmonary tuberculosis there is good correlation between the severity of the disease as judged by the usual clinical standards, including the blood sedimentation rate, and the diminution in the urinary titers of vitamin C. Extra vitamin C should be given in pulmonary as in other forms of tuberculosis to make up for the wastage.

In patients with rheumatoid arthritis low excretion of vitamin C was associated with high blood sedimentation rates.

It is suggested that the determination of the amount of vitamin C excreted under controlled conditions may be of use as an index to an infective state and also as an index to the activity of the infection.

LANGMANN, New York.

THE RELATION OF VITAMIN E TO THE ANTERIOR LOBE OF THE PITUITARY GLAND. M. M. O. BARRIE, Lancet **2**:251 (July 31) 1937.

Deprivation of vitamin E produced pathologic changes in female rats and their young, which are described, and the conclusion is drawn that in the rat vitamin E is necessary for the normal function of the anterior lobe of the pituitary gland. Female rats which are partly deficient in this vitamin will produce a living litter but are unable to rear it.

The young grow more slowly than is normal and are abnormal in appearance. They show flaccid paralysis and die within about three weeks.

LANGMANN, New York.

VITAMIN C IN CONCENTRATED AND POWDERED MILKS. A. SCHMID, Arch. de méd. d. enf. **40**:432 (July) 1937.

In view of the increasing consumption of evaporated and powdered milks the value of a systematic determination of the vitamin C content in these products is obvious.

The present report is issued from the Institute of Physiology at the University of Lausanne. It embraces an exhaustive investigation of preserved milks from the markets of Switzerland, Germany, England, Austria, France, Italy and the United States. It also includes a review of previous contributions in this field and describes in detail the various chemical methods of estimating the amount of this vitamin in foodstuffs. More than 1,200 titrations were made in this study. It was observed that dilution of milk influenced unfavorably the vitamin C content; fifteen minutes after dilution there was a loss of 13.7 per cent, and after one hour, a loss of 52.4 per cent. The process of fabrication also entails a loss of the vitamin to a greater or less degree. The average preserved milk contained 1.31 mg. per hundred cubic centimeters or grams and the best product, 1.58 mg.

AMESSE, Denver.

INFANTILE SCURVY AND VITAMIN C. T. COMBY, Rev. méd.-sociale de l'enf. **5**:262 (July-Aug.) 1937.

Comby presents nothing new from the historical or clinical standpoint but includes statistics concerning the types of feeding in 670 cases of scurvy collected by Concetti:

	Cases
Breast milk	20
Breast milk and complementary feeding	5
Artificial feeding (? type)	17
Sterilized cow's milk	174
Adapted cow's milk	19
Condensed milk	48
Pasteurized milk	24 (!)
Peptonized milk	30
Malt soup	86
Special feedings	116
Others	119

He discusses briefly the need for early introduction of fruit juices into the dietary of artificially fed infants, the heat lability of vitamin C, and synthetic vitamin C.

DIETRICH, Beverly Hills, Calif.

RICKETS AND HOUSING IN THE VARIOUS DISTRICTS OF THE CITY OF VENICE. D. BOTTACIN, Riv. di clin. pediat. **35**:749 (Aug.) 1937.

During the years 1933-1935 a census was taken listing the number and location of unhygienic and of crowded homes in each parish of the city of Venice. From the records of the baby clinics in Venice Bottacin has similarly listed the number and percentage of rachitic children in each parish. In the districts where the larger numbers of unhealthy and crowded homes were, there were also the greater rates of incidence of rickets.

Of 211 cases of rickets in which the social and the physical status of the child were carefully studied, the factor most responsible for the rickets was the unhygienic home in 110, dietary deficiency in 70, hereditary disease in 9, poor care in 3, infection in 2 and exudative diathesis in 1. In 16 cases no predominant factor could be found to explain the rickets.

HIGGINS, Boston.

Hygiene; Growth and Nutrition; Public Health

PROVISIONAL SUMMARY OF INFANT MORTALITY BY STATES FOR 1936 AND COMPARISON WITH PRIOR YEARS. Pub. Health Rep. **52**:844 (June 25) 1937.

In the United States in 1936 there were 121,525 deaths of infants under 1 year of age as compared with 120,138 in 1935. The infant mortality rate per thousand live births was 56.9 for 1936 and 55.7 for 1935. Nineteen states showed decrease in the death rate, and 29 states, an increase. The greatest decreases were in New Mexico, North Dakota, New Hampshire, South Dakota and Montana. The greatest increases were in the District of Columbia, West Virginia and Vermont.

SANFORD, Chicago.

PLACENTAL INFECTION IN INDUCED LABOUR, WITH SPECIAL REFERENCE TO ITS RELATIONSHIP TO FŒTAL AND NEO-NATAL MORTALITY. W. J. PENFOLD and H. M. BUTLER, M. J. Australia **2**:128 (July 24) 1937.

Penfold and Butler review the results of their examination of 114 placentas in cases in which labor was induced and conclude: (1) that induction of labor is frequently associated with infection of the placenta, (2) that the longer the interval

between induction of labor and final delivery the greater is the chance of infection of the placenta and (3) that placental infection has little relation to the condition of the mother. The placental infections due to Bacillus coli, nonhemolytic streptococci and Bacillus welchii proved to be associated with the highest rates of infant mortality. Bacteria cultivated from the dead infants were similar to those obtained from their placentas.

TENNEY, Madison, Wis.

A COMMISSION OF HYGIENE AND SOCIAL ASSISTANCE. M. HUBER, Bull. Soc. de pédiat. de Paris **34**:356 (June) 1936.

This is a report on a project for selection of tuberculous and convalescent children to be sent to the institutions of the Administration of Public Assistance or to private institutions after examination in hospitals. Sanatoriums should be reserved for children with active tuberculosis, and separate preventoriums should be provided for children with primary tuberculous infection. Children in whom the tuberculin test has proved negative should not be placed in these two types of institutions, but may be with children who have positive reactions to tuberculin if they have no demonstrable lesions or have calcified lesions which have been arrested for a long time. Infants who have primary tuberculous infections should be isolated because of the possibility of contamination of toys and other objects handled by them after putting their hands in their mouths. A tuberculin test should be made on every child, and if it is positive, a roentgenologic examination of the chest should be made. Appropriate centers are recommended for the treatment of children with rheumatic cardiac disease, as well as for those with infantile paralysis.

BENJAMIN, Montreal, Canada.

DUTY OF THE PHYSICIAN TO STUDY VITAL STATISTICS; INFANTILE MORTALITY AND ITS CAUSES IN THE PROVINCE OF FERRARA. M. ORTOLANI, Lattante **8**:431 (July) 1937.

In Ferrara, Italy, the mortality from gastrointestinal diseases in infants under 4 years of age has diminished from 32.3 per thousand live births in 1932 to 8.9 in 1936. However, the mortality from diseases of the respiratory tract and from congenital abnormalities has not diminished during this period.

HIGGINS, Boston.

CONJUNCTIVE HOSPITALIZATION OF NURSING BABIES AND MOTHERS. J. BONABA and M. L. SALDUN DE RODRIGUEZ, J. de pediat., Rio de Janeiro **4**:319 (Aug.) 1937.

This is an interesting description of the service at the Institute of Pediatrics and Puericulture in Rio de Janeiro, where nursing infants are hospitalized with their mothers. Photographs are shown of the system of cubicles in each of which an infant and its mother are isolated.

SANFORD, Chicago.

PROTECTION OF MOTHERS AND INFANTS IN THE REPUBLIC OF ARGENTINA. C. ROUST, J. de pediat., Rio de Janeiro **4**:358 (Aug.) 1937.

The work is organized into six divisions: (1) social hygiene of infancy, (2) eugenics of maternity and early infancy, (3) social hygiene of the preschool period and adolescence, (4) management of foundlings, (5) inspection and legislation and (6) social service.

SANFORD, Chicago.

TECHNICAL ASPECTS OF THE ANALYSIS OF BODILY CONFORMATION IN CHILDREN. W. KORNFELD, Acta pædiat. **19**:505, 1937.

Kornfeld reviews the anthropometric methods which are employed currently by the University Children's Clinic, Vienna. A table of length as a function of age and a table of weight as a function of length have been made up on the basis of a

large number of measurements of children of middle Europe. A coordinate system has been prepared in which weight is represented on the ordinates and length on the abscissas. The first step in the classification consists in allocating the patient with reference to his age and height, then with reference to his height and weight. The two allocations determine the position of a point which is plotted on the coordinate system. This point serves to visualize the patient's gross physical features at any given time; by determining a series of such points at different times the variations of the patient's body build through infancy and childhood can be represented in a graphic manner. A more refined method of analysis which is used in conjunction with the foregoing system is the determination of the trunk index; this is defined as the ratio between the height of the patient sitting and the patient's length from crown to sole. The trunk index is used in conjunction with the "relative circumference of the chest," which is the ratio of the circumference of the chest to the total length of the body. Values for these indexes have been gathered from a large number of observations. They are also represented on a coordinate system and used for the purposes already described. The circumference of the wrist serves as an index of skeletal type. Muscular development is judged by the circumference of the upper part of the arm and that of the calf of the leg. The state of the subcutaneous tissues is estimated by the thickness of a fold of skin lifted by the fingers; three sites are selected: one under the midpoint of the clavicle, another about 2 cm. above the umbilicus and a third between the vertebral column and the medial border of the scapula. A fourth method consists in measuring the width of the face with calipers, first applied lightly, then with firm pressure to points over the zygomatic arches.

The merits, demerits and possible applications of the method are discussed. A useful bibliography is appended.

McCune, New York.

Prematurity and Congenital Deformities

Intra-Uterine Respiratory Movements of the Human Fetus. F. F. Snyder and M. Rosenfeld, J. A. M. A. **108**:1946 (June 5) 1937.

Snyder and Rosenfeld are of the opinion that respiration is not initiated at birth but extends far back into embryonic life. They observed in rabbits, cats and guinea pigs periods of intra-uterine automatic respiratory activity. Activity of a similar nature could be noted through the abdominal walls of pregnant women near term. The respiration noted was superimposed on the movements due to maternal respiration, from which it could be differentiated by its more rapid rate (3 to 1). Respiratory failure of the newborn, or asphyxia neonatorum, must be considered as suppression of activity rather than as failure of a function to begin. The fetal respiratory system is sensitive to the depressant effect of anoxemia and narcosis, and caution in the choice of anesthetics should be more satisfactory in preventing depression of the respiratory function than later attempts at resuscitation. The aspiration of amniotic fluid is considered a normal consequence of fetal respiration rather than an accident of labor. These movements cause a tidal flow of amniotic fluid into the lungs, affording a mechanism for the dilation of the future air passages. Intra-uterine pneumonia may be considered a complication of normal intra-uterine respiration.

Bonar, Salt Lake City.

Arachnidism. A. S. Hargis, New England J. Med. **215**:489 (Sept. 10) 1936.

Poisoning from the bite of the black widow spider, Latrodectus mactans, is much more common than is generally believed. The black widow spider is so called because she devours the male. The mature female is a coal-black glossy insect, with a body about ½ inch (1 cm.) in length and slender legs covering a span of from 1½ to 2 inches (4 to 5 cm.). The abdomen is globose, and on the ventral aspect of the abdomen there is a bright red spot, usually in the shape of

an hourglass. The favorite haunts of the spider are dark and preferably dry places, such as outhouses. It is more frequently found around human habitations.

The greater number of cases of poisoning occur in the latter part of the summer and the first part of the fall, this period corresponding closely to the season when the spiders are most numerous.

The symptoms in well marked arachnidism are startling and dramatic. More often than not, when the patient is first seen by the physician, several hours have elapsed since he was bitten, and he is in intense agony. He may be rolling and tossing about the bed, unable to keep still. He may cry out at times, when the pain seems intensified. In a number of cases the patient has been disoriented and has become aware of his surroundings only several hours after admission to the hospital. The pain seems to spread slowly from the site of the bite. The muscle groups most frequently involved are those of the shoulders, back, abdomen and thighs.

The mortality from arachnidism has been given as from 2 to 3 per cent.

The author's method of treatment is to give morphine sulfate hypodermically, calcium gluconate intramuscularly, dextrose (50 cc. of a 50 per cent solution) intravenously, and hot tub immersion for one hour or more. The patient is kept warm, preferably with a radiant light. Fluids are forced, and constipation and urinary retention are avoided.

GENGENBACH, Denver.

PUBLIC ASSISTANCE TO NURSING INFANTS IN SAVOIE. J. CLERC, Rev. méd.-sociale de l'enf. **5**:276 (July-Aug.) 1937.

During the past seven years the Department of Public Assistance has taken over the problem of abandoned infants. Two possible solutions presented themselves: placement in orphanages and placement in rural families. The former disposition has the disadvantages of danger of infection and of promiscuity [at that age?]. Placement in families makes medical supervision more difficult and necessitates a careful choice of wetnurses.

As an ideal community Saint-Pierre-d'Albigny was selected, and within it suitable family groups were chosen. The mothers are paid for the care of the infants that are placed in their homes, and educational courses and clinics in infant care are provided for them. The infants are usually from 3 to 6 weeks of age at the time of placement. The feeding care of the infants is described in detail. Visiting doctors and nurses care for most ailments, but a hospital is provided for the more seriously ill infants. The plan has been very satisfactory, according to the author; its success obviously rests on meticulous care in the choice of foster homes.

DIETRICH, Beverly Hills, Calif.

THIRTEEN YEARS OF RURAL SOCIAL SERVICE. BONNENFANT, Rev. méd.-sociale de l'enf. **5**:283 (July-Aug.) 1937.

Bonnenfant discusses the organization for, and the results of, the care of infants and children in the rural districts devastated by the war. The usual triad of education, social service and visiting nursing service is discussed in twenty-four pages.

DIETRICH, Beverly Hills, Calif.

A GLANCE AT AGENCIES FOR THE PROTECTION OF MOTHERS AND SMALL INFANTS IN SWITZERLAND A. BERTSCHI, Rev. méd.-sociale de l'enf. **5**:307 (July-Aug.) 1937.

The paper is largely a listing of the agencies available for the care and guidance of mothers and infants. These facilities are grouped under the following headings: (1) clinics for infants, (2) orphanages, (3) nurseries and (4) preventoriums and convalescent homes. The paper provides a glance at the situation—and no more.

DIETRICH, Beverly Hills, Calif.

INFANT WELFARE IN BRAZIL. J. FREIRE DE VASCONCELOS and E. J. SILVEIRA SAMPAIO, Arch. de pediat., Rio de Janeiro **9**:359 (Aug.) 1937.

This article comprises the entire August issue of the journal and cannot well be abstracted. It is well worth reading in detail by any one interested in this subject.

SANFORD, Chicago.

AIR CONDITIONING AND EFFECTIVE TEMPERATURE AS APPLIED TO PREMATURE NURSERIES. S. W. WANG and T. F. FOSTER, Chinese M. J. **51**:1033 (June) 1937.

Wang and Foster discuss the progress of knowledge and practice in the regulation of temperature and humidity for premature infants. No mention is made of any Chinese nursery having been equipped with apparatus for air conditioning. The authors summarize by emphasizing that the method is practical and of great benefit in saving life. Undoubtedly they are anxious to have the knowledge transmitted to the hospitals of China.

NEFF, Kansas City, Mo.

Acute Contagious Diseases

AN APPRAISAL OF THE SCHICK TEST. F. H. TOP, Arch. Pediat. **54**:480 (Aug.) 1937.

The Schick test is a satisfactory method for determining susceptibility to diphtheria.

ORR, Buffalo.

CASES OF COWPOX ORIGINATING FROM VACCINATION. Health News **14**:128 (Aug. 9) 1937.

On June 12, a boy aged 18 years, who assisted in the care of a herd of twenty cows, was vaccinated against smallpox. The vaccination was successful. On June 18, evidently as a result of contact with this boy, pox developed in several of the cows. Ten days later a brother, aged 10, who also helped to care for the cows, presented typical vaccination pustules on his forearm and face. He recovered after a severe illness and had twelve typical scars. A third boy showed a lesion on his hand, which left a typical scar. Similar histories of transmission of vaccinia are rare.

AIKMAN, Rochester, N. Y.

ZINC SULFATE PROPHYLAXIS IN POLIOMYELITIS. E. W. SCHULTZ and L. P. GEBHARDT, J. A. M. A. **108**:2182 (June 26) 1937.

Three successive daily intranasal sprays of a 1 per cent solution of zinc sulfate in physiologic solution of sodium chloride will generally protect all or nearly all animals against poliomyelitis from virus administered one month after the treatments have been applied. The disease developed in 90 per cent of the controls. The method is described in detail, and investigations in human beings are advised.

BONAR, Salt Lake City.

STUDIES UPON THE PERTUSSIS BACILLUS: THE EFFECTS OF THE INTRODUCTION OF PERTUSSIS ANTIGEN INTO THE NASAL PASSAGES. P. H. LONG and E. A. BLISS, J. Infect. Dis. **61**:100 (July-Aug.) 1937.

These experiments showed that it was possible to obtain an antibody response in the serum of rabbits following intranasal vaccination with varying amounts of heat-killed pertussis vaccine. When this method of immunization was applied to human beings, seven of eleven subjects showed the development of complement-fixing antibodies in their serum. What significance the complement-fixing antibodies have in actual immunity to whooping cough is as yet not clear, but if one

may judge from the results of certain investigations concerning immunity in whooping cough which are in progress in the laboratory with which the authors are associated, they probably represent a response which is not essential in the actual immunity to the disease.

TOOMEY, Cleveland.

PURIFICATION AND PRECIPITATION OF THE ERYTHROGENIC FACTOR OF SCARLET FEVER STREPTOCOCCUS TOXIN AND ITS ANTIGENIC VALUE. M. V. VELDEE, Pub. Health Rep. **52**:819 (June 25) 1937.

Veldee agrees with other workers that the scarlet fever toxin is composed of two fractions: first, an alcohol-insoluble, heat-labile, toxin-neutralizing fraction, which is the main factor in the Dick test, and second, a fraction which is insoluble in both alcohol and acetic acid and represents nucleoprotein, which causes positive reactions in the skin of persons previously sensitized to the protein of the streptococcus of scarlet fever by contact with this organism. He prepared a purified and insoluble antigen by tannic acid precipitation of the first mentioned toxin fraction. The injection of three intradermal doses of 750, 3,000 and 10,000 skin test doses, respectively, changed the Dick reaction from positive to negative in 80.4 per cent of the 1,638 children treated. There were some reactions but much less local and general reaction than in the 498 other children treated by subcutaneous or intramuscular injections (comparable results).

SHAW, Evanston, Ill.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **52**:913 (July 9) 1937.

For the period from May 23 to June 19, 1937, influenza, meningococcic meningitis, poliomyelitis, scarlet fever and smallpox were above median prevalence. Diphtheria, measles and typhoid fever were below median prevalence. The mortality from all causes was 11 per thousand, which is average.

SANFORD, Chicago.

TWO UNUSUAL CASES OF DIPHTHERIA. E. F. DAWSON-WALKER and E. G. BREWIS, Brit. J. Child. Dis. **34**:107 (April-June) 1937.

In common with other parts of the country the Newcastle and Tyneside area showed a marked increase in cases of diphtheria starting in 1934.

The first case was one of severe nasopharyngeal diphtheria in a 9 day old infant, who for a period after convalescence became a persistent carrier of virulent organisms.

The second case was that of a boy of 12 in whom chorea developed in the midst of several other nervous complications of the disease, including palatal and bulbar paralysis. The choreic condition, indistinguishable clinically from Sydenham's chorea, lasted about a week and was replaced by multiple peripheral neuritis. Complete paralysis of the lower limbs developed, with absence of deep and superficial reflexes. There was also weakness of the neck muscles, with pronounced weakness of the upper extremities. Improvement was noted eleven days after the onset of the paralysis, but walking was not possible until eleven weeks later. The chorea in this boy was regarded as due to the action of the diphtheria toxin on the basal ganglions and higher centers. Examination of the boy eighteen months after his discharge revealed no damage either of the nervous or of the cardiac system.

LANGMANN, New York.

ACUTE ENCEPHALOMYELITIS COMPLICATING CHICKEN-POX. D. MACINTYRE and H. L. W. BEACH, Brit. J. Child. Dis. **34**:113 (April-June) 1937.

Lesions of the nervous system following chickenpox are admittedly rare.

A case is reported of a 7 year old girl in whom, following an attack of chickenpox, paralysis of the lower extremities developed, with an accompanying anesthesia. There was incontinence of urine. Then followed paralysis of both arms,

with blunting of cutaneous sensation, and transient rigidity of the neck together with loss of vision in the left eye.

In the course of three weeks the various paralyses had cleared, and vision had returned completely. Eight months after discharge no sign of mental or physical weakness was detected.

Boquet concluded from his study that encephalitis complicating chickenpox is characterized by relative benignity and gradual regression. Recovery is almost always complete. In a few cases the condition has had a fatal termination at an early stage. Underwood in 1935 described a case of cerebellar ataxia in a girl of 8 with complete recovery.

LANGMANN, New York.

TREATMENT OF LARYNGEAL DIPHTHERIA. A. G. ROBB, Brit. M. J. **2**:264 (Aug. 7) 1937.

Robb's presentation is a part of a symposium. He mentions three methods of treatment, namely, tracheotomy, O'Dwyer's intubation and electric suction. He states, and it is agreed, that only the first two are of practical importance. Electric suction, he states, is new, and the general opinion is that its field of usefulness is small. [American opinion differs from this.—Abstractor.] After a brief preliminary discussion he begins his comparison of results by a statement of the results obtained in the Belfast City Fever Hospital since its opening thirty years ago in all cases of laryngeal treatment by the operative procedures outlined. In sixty-one cases it was necessary for tracheotomy to be performed secondary to intubation because of the patient's failure to retain the intubation tube after many reintubations. In some instances secondary tracheotomy was done to get rid of the intubation tube.

The reasons for choosing tracheotomy were: 1. The trachea was not large enough to take the smallest intubation tube readily (!). 2. So much edema was present that there did not appear to be any prospect of an intubation tube being retained. 3. The intubation tube did not fit comfortably. 4. In the early years, in a small number of cases, there was no one at hand with the necessary experience with intubation.

Robb does not feel that all the reasons are valid. He thinks that on the whole intubation is preferable to tracheotomy and that the end-results prove this.

The main objections made to intubation are: 1. There is danger that loose membrane will be pushed down, with consequent obstruction to breathing. 2. There is danger that the tube will be coughed out and that suffocation will occur before it can be replaced. The risk of the former is slight. The second possibility is serious and may lead to disaster. Intubation is more difficult than tracheotomy unless the intubator has had considerable experience. Robb feels that on the whole intubation is preferable to tracheotomy as a primary resort.

ROYSTER, University, Va.

A MICROSCOPICAL INQUIRY INTO THE AETIOLOGY OF MEASLES. A. C. COLES, Edinburgh M. J. **44**:483 (July) 1937.

Coles, working at the Royal National Sanatorium and the Victoria Hospital, Bournemouth, England, attempted to determine whether visible bodies of a virus could be found in the blood or secretions during the progress of measles. He describes round, oval or sometimes slightly spindle-shaped minute bodies which stained red with Giemsa—quite definite and distinctive structures. The bodies were usually single, seldom in pairs or chains. They were recovered from peripheral blood, lesions of skin, smears of matter from throats and nasal, lacrimal and bronchial secretions, and there were small numbers in Koplik's spots. Films were made in fourteen cases of measles.

Coles has no proof except what the microscope showed, and he frankly states that these elementary bodies cannot as yet be definitely regarded as identical with the actual causal virus of measles.

NEFF, Kansas City, Mo.

DIPHTHERIA IMMUNIZATION IN THE NURSING STAFF OF RUCHILL FEVER HOSPITAL. T. ANDERSON, Glasgow M. J. **128**:1 (July) 1937.

Toxoid-antitoxin floccules or alum-precipitated toxoid was given to 198 nurses. None contracted diphtheria. The total dose of antigen used in alum-precipitated toxoid may be a factor in establishing immunity. No advantage was found for the intradermal injection of alum-precipitated toxoid.

SNELLING, Toronto, Canada.

IMMUNE GLOBULIN (HUMAN) LEDERLE IN THE PREVENTION OF MEASLES. ALICE K. MONTGOMERY, Glasgow M. J. **128**:89 (Sept.) 1937.

Twenty children convalescing from whooping cough were exposed to measles. Fourteen of these had not had measles. Ten patients received 10 cc. of immune globulin (human), and 4 received 5 cc. A slight fever developed in 1 child on the sixteenth day after exposure. In 1 child atypical measles developed twenty-one days later; in a third child typical measles developed thirty-three days after exposure. All 3 of these children had received 10 cc. of immune globulin. The infectious nature of the disease when attenuated does not appear to be modified.

SNELLING, Toronto, Canada.

ACUTE ANTERIOR POLIOMYELITIS. HARRY L. PARKER, Irish J. M. Sc., July 1937, p. 303.

The author reports 3 cases in which a local injury of one extremity or the other preceded flaccid paralysis. Subsequent to the injury a disease characterized by fever, headache and stiffness of the neck developed. When first seen by the author some time later, each patient had paralysis of the extremity. Each patient considered the injury the cause. However, the author feels that the paralysis was a result of acute anterior poliomyelitis affecting the muscles at the site of the injury.

SNELLING, Toronto, Canada.

THE SUPRARENAL GLANDS IN DIPHTHERIA. A. MACLEAN, J. Hyg. **37**:345 (July) 1937.

The symptoms, the laboratory findings and the pathologic picture of the adrenal glands are almost identical in human beings with clinical diphtheria and in susceptible experimental animals with diphtheria intoxication. There is a similar correspondence in other conditions in which the adrenal cortex is involved. It is concluded that the diphtheria toxin has a special affinity for the adrenal cortex. Lesions of the adrenal glands from various causes produce a definite chain of symptoms from mild asthenia to rapid fatality (as in acute hemorrhage of the adrenals) or the more typical picture of Addison's disease.

The main effects of a deficient secretion of the adrenal cortex are: (1) increase of the water content of the liver and skeletal muscle, decrease of water in the circulating blood and diminution of secretion of water in the urine; (2) decrease of sodium and chlorine in the circulatory blood and increase in the excretion of sodium and chlorine in the urine, and (3) decrease of carbohydrate in the circulating blood and of the carbohydrate reserve in the tissues.

Deficiency of the secretion of the adrenal cortex in animals is best treated by injections of extract of adrenal cortex. The most useful adjunct to this treatment is the administration of sodium chloride.

Diphtheria intoxication in susceptible animals produces necroses and hemorrhages in the adrenal cortex as well as a loss of lipoid material. This condition is greatly mitigated by the previously mentioned treatment.

Data from 84 cases of diphtheria show the chief difficulty to be all these symptoms, signs and laboratory findings found in men and animals due to injury to the adrenal cortex from a great variety of causes. Important among these are

subnormal blood pressure, asthenia, syncopal attacks, nausea and vomiting and the previously mentioned chemical changes in the blood and the urine.

It is concluded that lesions of the adrenal glands must play a considerable part in the production of the symptoms of diphtheria and that the administration of sodium chloride (of accepted value in the treatment of deficiency of the adrenal cortex) is of value in the treatment of diphtheria.

JANNEY, Wauwatosa, Wis.

EXTREME DEGREE OF LEUCOCYTOSIS IN WHOOPING COUGH. W. J. PEARSON and G. H. NEWNS, Lancet **2**:254 (July 31) 1937.

A boy 5½ years old contracted whooping cough a few days after tonsillectomy. The prominent features were pallor and lethargy. He showed 2,975,000 red blood cells per cubic millimeter, with 51 per cent hemoglobin and 145,000 white blood cells, with 53 per cent lymphocytes. The following day the white cells were again 145,000, and a week later, 140,800; a week after that the count had fallen to 36,300. In this case as in two others, reports of which are quoted and in which a very high leukocytosis was present, there was complicating bronchopneumonia.

LANGMANN, New York.

A DILUENT FOR DIPHTHERITIC TOXIN FOR SCHICK'S TEST. C. W. ADEY and R. W. PATTERSON, M. J. Australia **2**:248 (Aug. 14) 1937.

A diluent for making a stable solution of stable toxin for Schick testing is described, which consists of boric acid, sodium chloride, borax, purified gelatin and distilled water. This material has a p_H of 8. It is sterilized by autoclaving and the addition of sodium ethyl mercurithiosalicylate to a concentration of 0.01 per cent.

TENNEY, Madison, Wis.

DIPHTHERIA IMMUNIZATION: THE NEW DILUTED SCHICK FLUID. C. R. MERRILLEES, M. J. Australia **2**:251 (Aug. 14) 1937.

The material described by Adey and Patterson in the same issue of the *Medical Journal of Australia,* page 248, was tried with about 5,000 children and found to be entirely reliable and extremely convenient for testing on a large scale.

TENNEY, Madison, Wis.

"Q" FEVER, A NEW FEVER ENTITY: CLINICAL FEATURES, DIAGNOSIS AND LABORATORY INVESTIGATION. E. H. DERRICK, M. J. Australia **2**:281 (Aug. 21) 1937.

"Q" fever represents another definite entity culled out from the composite "coastal fever." It has certain resemblances to typhus but is distinguished therefrom by the absence of a characteristic rash and by a negative response to the Weil-Felix test. The onset of the illness is acute, and the outstanding symptom is headache. Recovery may take place by crisis after from six to nine days or by lysis after from three to four weeks of illness. None of nine cases observed by Derrick was fatal. The disease may be transmitted to guinea pigs by inoculation with the blood or urine from patients. One attack in a guinea pig confers immunity. Rats are mildly susceptible and rabbits are insusceptible to the disease. The epidemiology is obscure. Most cases, however, occur in handlers of meat or dairy farmers.

GONCE, Madison, Wis.

ACTIVE IMMUNIZATION AGAINST DIPHTHERIA BY THE COMBINED SUBCUTANEOUS AND INTRANASAL METHOD. C. JENSEN, Proc. Roy. Soc. Med. **30**:1117 (July) 1937.

In his introduction Jensen points out that in Denmark the actual number of persons inoculated against diphtheria is relatively small. This is not due to failing interest on the part of the health authorities but to two other circumstances:

1. The number of cases of diphtheria in Denmark has for some years been very low. 2. Health officers have been waiting until they are in possession of the most effective, harmless and suitable method for mass immunization against diphtheria. Here Jensen takes up his investigations, dividing them into the following groups:

1. The natural and the artificial antitoxin spectrum as an expression of the immunity of a population.

2. Active immunization by means of one inoculation.

3. Improvement of the "one dose immunization" method.

4. Active immunization by the combined subcutaneous and intranasal method. This group is subdivided into (1) experiments on rabbits and (2) investigations in children and adults.

5. The practical prevention of diphtheria by the combined subcutaneous and intranasal method.

The discussion of each group is accompanied by tables, charts and graphs.

Jensen feels convinced from experience in Denmark that the combined subcutaneous and intranasal method will prove to be an effective and practicable means whereby active immunization of human populations against diphtheria can be achieved.

WILLIAMSON, New Orleans.

PREVENTION OF SEQUELAE IN VACCINATION AGAINST SMALLPOX. OPITZ, Bull. Assoc. internat. de pédiat. prevent. **4**:5, 1937.

An account is given of the harmful symptoms consequent on vaccination, and a distinction is drawn between those which occur in the vaccinated child and those which occur in its nonvaccinated associates. The symptoms may be the direct consequence of the operation, in which case a distinction should be made between specific and nonspecific complications.

A large proportion of these complications are preventible. A smaller part can be avoided by indirect means. Thus the number of inevitable cases is extremely small. These include cases of vaccinia generalisata and to a certain extent also cases of encephalitis. To combat these diseases one should be far more careful in passing children for vaccination. Unfavorable conditions should be more widely defined, and children with the following difficulties should certainly be excluded: (1) slight disorders of the digestive and respiratory organs (all children predisposed thus should likewise be excluded), (2) nervous instability and spasmophilic tendencies, (3) rickets, (4) otitis media, (5) acute infectious diseases and (6) active tuberculosis. Allergic children under the age of 3 should be regarded as being in the sixth class.

It is also possible to diminish the harmful consequences of vaccination by reducing the number of incisions to two and by using special bandages.

AMESSE, Denver.

RÉSUMÉ OF THE USE OF PLACENTAL EXTRACT IN THE INFECTIOUS AND CONTAGIOUS DISEASES. REYNOLDO AGRELO, Rev. méd. latino-am. **22**:1204 (Aug.) 1937.

Immune globulin is apparently an effective agent in the prevention and modification of measles. The author obtained good results by oral administration, but its subcutaneous administration is much more effective. More experimentation is needed to establish its value in rubella, scarlatina and poliomyelitis.

DWYER, Kansas City, Mo.

PRACTICAL SIGNIFICANCE OF THE DICK TEST. Z. TEVELI, Orvosi hetil. **81**:551 (May 22) 1937.

In cases of scarlatina in which there is high fever the Dick test usually produces negative results in the first days of the illness, and the blood does not yet

contain any antitoxin. This anergy is probably caused by toxin. A negative reaction to the Dick test, associated with a lack of antitoxin in the blood, is sometimes to be seen in healthy children under 3 years old and in children with sepsis or measles. In children with scarlatina the initial negative anergy may be followed by positive anergy—i. e., the anergy in the later stage is caused by immunity. If in cases of mild scarlatina the reaction to the Dick test is first positive and later becomes negative, the illness should be regarded as scarlet fever, because a positive reaction to the Dick test rarely occurs after the fourteenth day of scarlatina. In cases of sepsis the Dick test cannot indicate whether the sepsis is caused by scarlet fever or not.

GÖTTCHE, Budapest, Hungary.

CONTROL OF DIPHTHERIA: SCHICK TEST AMONG CHINESE. P. L. FAN, Chinese M. J. **51**:879 and 893 (June) 1937.

The Schick Test Among the Chinese.—Lai was the first to investigate susceptibility to diphtheria in China, performing the Schick test on students in 1931. Fan and his colleagues performed the test on children in rural and urban communities, on inmates of orphanages and on students in the schools. Rural children showed a larger percentage immune, owing to living in crowded villages; children of orphanages likewise showed an even greater tendency toward immunity.

From the age of 6 months to preschool age 80 to 90 per cent give positive reactions to the Schick test; among those of primary school age 40 per cent are susceptible. The percentages of positive reactions in boys is 48.84; that in girls is 56.59.

Active Immunization Against Diphtheria.—Fan also reports from the Cheeloo University Medical School and Hospital the results of active immunization. Tables are given representing the statistics in other countries for the different mixtures used in such work. Many of the Chinese who were being treated did not return for a second dose of toxoid. The figures are small, but are in favor of both alum and regular toxoid mixtures.

NEFF, Kansas City, Mo.

SEVEN YEARS OF JENNERIAN VACCINATION IN TINGHSIEN. C. C. CH'EN, H. W. YÜ and F. J. LI, Chinese M. J. **51**:953 (June) 1937.

Vaccination was introduced into China in 1805, but the disease is still prevalent because of the interrupted, incomplete attempts at prevention. Therefore epidemics appear from time to time where vaccination is neglected. However, the present condition is one exciting optimism because the people are being more educated, remote villages are being reached, and there are successful efforts at organization of laymen. Formerly the notion was prevalent that vaccination could be done only in the spring of the year. Now a two months' campaign is recommended for the fall as well as for the spring.

In the region of Tinghsien the number of persons vaccinated each year is growing, one seventh of the total population having been vaccinated up to the end of 1936. A difficulty is found in vaccinating girls and women, who are bashful about exposing their arm to a vaccinator. This contributes to an unequal distribution of the vaccinated between the sexes. But the problem may be solved largely through reaching infants soon after birth. In Tinghsien 10,000 babies are expected to be born each year. Last year 75 per cent of the new-born children were reached.

Smallpox has been kept under control for the last seven years by extensive vaccination. The cost per vaccination is only 2.5 cents.

NEFF, Kansas City, Mo.

THE SKIN AND SUBCUTANEOUS REVACCINATION. H. NAGAI, I. SAKAWA, Y. HAMAMOTO and T. UNO, Orient. J. Dis. Infants **21**:319 (May) 1937.

In a group of 482 young nurses, of whom 77.1 per cent had had three previous vaccinations, the investigators compared the nature of reactions produced by

cutaneous and by subcutaneous revaccination. The revaccinations were, as is usually the case, less than 2.5 per cent successful, and the shorter the interval between the vaccinations, the less frequently was the reaction positive. The authors observed that the allergic reactions so often accompanying revaccination should not be confused with true immunologic reactions and that the degree of allergic reaction depends both on the degree of reactivity of the tissues and on the purity of the vaccine used. Emphasis is laid on the necessity of employing pure products, in order to minimize the allergic reactions which may confuse the observer.

KATO, Chicago.

THE CHANGE OF THE BLOOD IN DIPHTHERIA, ESPECIALLY AT THE TIME OF APPEARANCE OF SERUM DISEASE. B. SUGIYAMA, Orient. J. Dis. Infants **21**:389 (May) 1937.

The author investigated the blood in cases of uncomplicated diphtheria both before and after injections of diphtheria antitoxin, especially in cases in which there was a reaction to serum. At the time of admission to the hospital the average blood count showed 5,186,800 erythrocytes, 15,500 leukocytes and a differential count of 55.9 per cent neutrophils, 1.6 per cent eosinophils, 0.35 per cent basophils, 1.7 per cent transitional forms, 2.5 large mononuclears, 3.4 per cent large lymphocytes and 32 per cent small lymphocytes. During the serum reaction following injection of antitoxin the average number of erythrocytes was 4,688,200 and of leukocytes 12,700. The differential count revealed both a relative and an absolute increase in the neutrophils and particularly in the eosinophils (4.5 per cent), at the expense of the small lymphocytes. Other leukocytic elements showed little change.

KATO, Chicago.

Acute Infectious Diseases

PUBERTY AND PROGNOSIS IN RHEUMATIC FEVER. M. LEONARD, Am. Heart J. **14**:192 (Aug.) 1937.

Primary and recurrent attacks of rheumatic fever show a sharp decline in frequency as puberty is approached. Two factors suggested as probably contributory to this decline are: (1) a gradual decrease in susceptibility following the ages from 7 to 9 years; (2) the tendency for the recurrent attack to occur shortly after the primary attack.

GIBSON, Chicago.

RABIES IN ILLINOIS IN 1936. G. H. GOWEN, Illinois M. J. **72**:174 (Aug.) 1937.

Gowen reports statistics on 1,131 persons who during 1936 received antirabic vaccine because of having been bitten by, or in contact with, animals that were rabid or suspected of being rabid, and he relates the histories of eleven cases in which human death resulted from rabies during 1936. He notes that in every case there had been one or more violations of the accepted procedures in such cases. Of the 1,131 cases of animal bite, only in 18 per cent had the wound been cauterized with nitric acid. Gowen points out that there are no known contraindications to giving antirabic vaccine, and that persons of all ages and conditions should be inoculated if exposed.

BARBOUR, Peoria, Ill.

STUDIES ON OXYURIASIS: THERAPY WITH SINGLE DOSES OF TETRACHLORETHYLENE. W. H. WRIGHT, J. BOZICEVICH and L. S. GORDON, J. A. M. A. **109**:570 (Aug. 21) 1937.

Forty-seven boys infested with pinworms were treated with single doses of tetrachlorethylene by mouth at a dosage of 0.1 cc. for each year of apparent age. Because magnesium sulfate was a disagreeable menstruum, magnesium citrate was used as the purgative in the remaining cases. Evidence pointed to the greater

effectiveness of the single dose method in cases of relatively light rather than heavy infestation. Tetrachlorethylene appears to be one of the best drugs for the single dose treatment of pinworms.

BONAR, Salt Lake City.

OCCURRENCE IN THE SERA OF MAN AND MONKEYS OF PROTECTIVE ANTIBODIES AGAINST THE VIRUS OF LYMPHOCYTIC CHORIOMENINGITIS AS DETERMINED BY THE SERUM-VIRUS PROTECTION TEST IN MICE. J. G. WOOLEY, C. ARMSTRONG and R. H. ONSTOTT, Pub. Health Rep. **52**:1105 (Aug. 13) 1937.

The authors describe a serum-choriomeningitis virus protection test in mice, which appears to be practicable for monkeys and man. Of the serums from 481 adults over 17 years of age, 18.3 per cent demonstrated antibodies, while only 1.2 per cent of the serums from 396 persons under that age showed protection. This occurrence of antibodies in the serums of persons without a clinical history of involvement of the central nervous system indicates that immunity may result from a subclinical infection as well as from a frank meningeal involvement.

SANFORD, Chicago.

THE FIRST TWELVE MONTHS OF INFANCY AS A TEST FOR THE COMMUNITY INCIDENCE OF INITIAL ATTACKS OF MALARIA. H. C. CLARK, South. M. J. **30**:848 (Aug.) 1937.

Congenital malaria must be extremely rare in early infancy. During the first two months of life the infant appears to be protected by something from the mother or associated with the nursing period. Whatever this factor is, it is lost about the twelfth month.

SCHLUTZ, Chicago.

EPIDEMIC MYALGIA IN CHILDREN. W. N. PICKLES, Brit. J. Child. Dis. **34**:85 (April-June) 1937.

The author describes a small epidemic of epidemic myalgia, sometimes also referred to as epidemic pleurodynia, myositis epidemica or Bornholm disease.

The onset was acute, with spasmodic pain in the upper part of the abdomen, accompanied by profuse sweating and rapid shallow painful breathing. There was fever for a day, up to 103 F., with a recurrence on the third day and again on the fifth or sixth; there was no evidence of infection of the upper respiratory tract nor was there vomiting. Complete recovery occurred in from four to six days.

The children appeared to be extremely ill, but if the diagnosis was clear, the prognosis was good.

LANGMANN, New York.

A VIRUS IN THE ETIOLOGY OF RHEUMATIC DISEASES. G. H. EAGLES, P. R. EVANS, A. G. T. FISHER and J. D. KEITH, Lancet **2**:421 (Aug. 21) 1937.

In a study of rheumatic fever the following experiment was made: Pericardial exudates, usually obtained post mortem, and pleural fluids, usually obtained during life, were mixed with 3.8 per cent sodium citrate. A preliminary spinning at from 3,000 to 4,000 revolutions per minute removed cells and fibrinous aggregations. The supernatant fluids were subjected to centrifugation at 14,000 revolutions per minute for one hour. This resulted in deposition of a small plaque on the bottom of each tube. The plaque was removed and thoroughly triturated and mixed with suspending fluid (saline solution to which solution of formaldehyde, U. S. P., was added in the concentration of 0.25 per cent). The washed deposit was retriturated and again centrifugated. The final supernatant fluid was removed and stored for morphologic examination and serologic tests.

Suspensions from rheumatic exudates prepared in this way showed by direct illumination the typical bluish opalescence observed in suspensions of known virus particles. Suspensions prepared from a variety of materials obtained in cases of acute rheumatic fever, rheumatoid arthritis and chorea showed particles bearing a

close resemblance to elementary bodies of known virus infections. Examination was made of joint fluid, blood plasma, subcutaneous nodules (ground up and diluted in suspending fluid), cerebrospinal fluid, fibrinous exudate, ascitic fluid and urine.

Suspensions prepared from material obtained from nonrheumatic sources bore a close resemblance to those obtained from rheumatic sources and to undisputed virus elementary bodies of comparable size.

The main findings included the following: Serums from patients with rheumatic fever, chorea and rheumatoid arthritis agglutinated suspensions from the corresponding diseases. Cross-agglutination occurred within the whole group with sufficient regularity to point to an interrelationship and to cause one to hypothecate a virus similar to that of rheumatic fever as a possible etiologic factor in rheumatoid arthritis and chorea.

Agglutination of rheumatic fever suspensions by rheumatic fever serums occurred with various types of the disease and when the disease process was active and also when it became inactive. Stated in general terms, the number of serums giving positive agglutination was about equal to the number showing no agglutination.

Eagles and his collaborators state that "until further evidence of the nature of the agglutination reaction in rheumatism is obtained, or the infectivity of the particulate bodies proven, it should be assumed that it is specific for the rheumatic group, and in the absence of definite proof of a bacterial etiology, as evidence of possible virus infection."

LANGMANN, New York.

OXYURIASIS IN THE INFANT. G. P. BELLOCQ, Bull. Soc. de pédiat. de Paris **34**:401, 1936.

An infant 4 months old was intestinally infested with Oxyuris vermicularis. The contaminant was believed to be well water in which nipples were kept. Cure followed two months' treatment with suppositories of mild mercurous chloride U.S.P., rectal instillations of glycerin containing garlic, application of ointment to the anus and administration of powdered wormseed by mouth. Periods of rest of several days alternated with periods of treatment. Failure in the treatment of this condition is believed to be due to deposition of ova in the intestine by gravid female worms on their way toward the exterior to lay their eggs, as well as to autoreinfestation.

BENJAMIN, Montreal, Canada.

STUDIES ON THE PROTEOSE SUBSTANCE OF ORIEL IN TYPHOID WITH PARTICULAR ATTENTION TO ITS THERAPEUTIC USE. G. MELODIA, Méd. inf. **8**:229 (Aug.) 1937.

Following the technic of Oriel, Melodia separated from the urine of patients with typhoid a proteose. Skin tests were made with this—diluted 1:4,000—on ten patients with typhoid; nine of them showed a definitely positive reaction. Tests on ten controls yielded a very positive reaction in one, a slight reaction in five and no reaction in four.

Twenty-two patients with typhoid were given hypodermic or subcutaneous injections of the proteose to test its therapeutic value. In some of the patients the improvement was remarkable; in others the disease ran its usual course. In five patients treated during the first week of the disease, cure as measured by normal temperature was established in a mean period of eight and a half days. Similar observations during the second week of the disease with eight patients and during the third week of the disease with eight patients showed cure in eight and a half and in six and a third days, respectively.

The finding in the urine of a proteose with therapeutic value lends support to the theory that infectious disease can be considered as a state of hypersensitivity to the pathogenic organism that produces it.

HIGGINS, Boston.

Chronic Infectious Diseases

Effect of Irradiated Milk on Experimental Inhalation Tuberculosis in Guinea Pigs. D. F. Loewen and W. H. Oatway Jr., Am. Rev. Tuberc. **35**:733 (June) 1937.

The animals used in this experiment were infected by inhalation of a spray. One group of animals was not sensitized before infection and in this group a disease was produced which was similar to primary infection. Another group was sensitized and later infected, with production of the reinfection type of tuberculosis. Irradiated cream was added to the diet of the various groups, but it did not exert any noticeable influence on the calcium content of the lungs of either the tuberculous or the nontuberculous animals. The calcium content of the lungs of the tuberculous animals corresponded proportionately to the extent of the tuberculous involvement of these organs and was independent of the amount of calcium in the diet. This was true of both the sensitized and the nonsensitized animals. Sensitization, however, gave guinea pigs remarkable protection against tuberculosis. The type of the disease produced in the sensitized animals was sluggish, fibrous and productive, and caseation was rare.

Eugene Smith, Ogden, Utah.

Ulcerative Tuberculous Tracheobronchitis. J. B. Barnwell, J. Littig and J. E. Culp, Am. Rev. Tuberc. **36**:8 (July) 1937.

The symptoms of this complication of pulmonary tuberculosis in a small group of cases intensively studied were: shortness of breath occurring early in the disease, with at times acute attacks of dyspnea, wheezing and rattling, palpable rhonchi (not displaced by cough and localized or general over both lung fields), oppression in the chest, violent paroxysms of coughing and cyanosis. Physical examination revealed audible and palpable localized ronchi. Roentgen examination showed at times a shift of the mediastinum toward the affected side, an elevation of the diaphragm and transient atelectasis. Visualization of the ulcers by bronchoscopy, while the only certain method of making a diagnosis, is capable of causing harmful reactions and is not recommended as a routine diagnostic measure. Therapeutic bronchoscopy may be necessary, however, to relieve impending suffocation.

Eugene Smith, Ogden, Utah.

Tuberculin Allergy Produced by Parenteral BCG Vaccination. C. Kereszturi, H. A. Rosenberg and W. H. Park, Am. Rev. Tuberc. **36**:90 (July) 1937.

The development of allergy to old tuberculin (Mantoux method) was studied in 292 children vaccinated intracutaneously and 41 vaccinated subcutaneously with BCG. In both groups the highest incidence of allergy occurred at the end of the sixth month. The development of allergy was more rapid in the children who were vaccinated intracutaneously. For producing allergy by intracutaneous vaccination the optimal dose of vaccine was found to be 0.15 mg. of a suspension of 40,000,000 slightly virulent bacilli to the milligram.

Eugene Smith, Ogden, Utah.

Tuberculosis in Childhood. J. B. Sidbury, South. M. J. **30**:769 (Aug.) 1937.

In general, the treatment is essentially the same as that of tuberculosis in adults. The childhood type, as a rule, needs no specific treatment. Usually the patients have no symptoms and no fever, and if allowed to follow the routine of a normal, healthy child of that age, no other treatment is necessary except to avoid strenuous exercise and to insist on a period of rest each afternoon.

Children who have primary lesions in the inflammatory stage or caseous glands and fever are kept in bed and given fresh air and plenty of nourishing food.

Those who have the adult type of tuberculosis are treated as one would an adult. If there is a cavity, pneumothorax therapy is given. Advanced lesions are treated just as they are in adult tuberculosis.

What one needs most of all is a preventorium where children with pulmonary lesions whose home conditions are unfavorable may be properly treated.

SCHLUTZ, Chicago.

EDINBURGH TUBERCULOSIS SCHEME, 1887-1937. Edinburgh M. J. **44**:285 (May) 1937.

The leading article in this number, devoted to the development of the program against tuberculosis in Edinburgh, is a testimonial to Sir Robert Philip, who initiated the campaign in 1887 and is still guiding it. His efforts began five years after the discovery of the tubercle bacillus by Koch.

Sir Robert founded the first antituberculosis dispensary. It was a center for all activities against tuberculosis, such as deciding whether a patient should be in a home, a sanatorium or a hospital. Among many activities was the establishment of open air shelters for sleeping quarters and of open air schools for children who were sent back to their homes at night. The centers were headquarters for propaganda by lectures and literature.

Many of the Edinburgh methods were followed as a national policy. Calmette established a preventorium in France in 1900, and within five years fifty others were begun. New York and Germany in 1904, Canada in 1908 and London in 1909 followed the example of Scotland. In 1936 Great Britain had 630 dispensaries patterned after the model at Edinburgh.

In 1917 Philip was appointed to the first chair of a professor of tuberculosis ever created in any university. The Royal Victoria Hospital Tuberculosis Trust has among its activities the treatment of tuberculous children and a school for them at Liberton, since 1922. There is a model farm dairy, where cattle are tested with tuberculin and the animals kept out of doors day and night.

Clinical teachers and public health officers were given postgraduate instruction in tuberculosis. The Edinburgh Scheme has had a worldwide influence on the knowledge and practice of tuberculosis prevention. NEFF, Kansas City, Mo.

TUBERCULOUS GINGIVAL LESION. ALBERT VALLETTE and BERTHOLD ROSENKRANZ, Bull. Soc. de pédiat. de Paris **34**:465 (July) 1936.

A girl 7 years old had an ulcer on the right side of the lower gum which extended onto the inner surface of the cheek. The lesion appeared seven weeks before she came under observation. The right submaxillary glands were swollen and matted together. Her reaction to tuberculin had been negative less than two years before. Erythema nodosum developed five weeks after her admission to the hospital. Biopsy of the lesion showed it to consist of tuberculous granulomatous tissue. A roentgenogram of the chest showed no abnormality. The authors express the belief that this case was one of primary tuberculous invasion of the mucous membrane of the lupous type, although the condition is rare. Treatment consisted of applications of lactic acid locally and ultraviolet therapy to the entire body, in addition to the usual antituberculous regimen. After several months cicatrization of the lesion took place, and the submaxillary glands diminished to such a size that they were palpable. BENJAMIN, Montreal, Canada.

A COMMON DISORDER OF TUBERCULOUS INFANTS. E. LESNÉ and others, Nourrisson **25**:141 (May) 1937.

A study of infants with reactions to tuberculin but without other evidence of active infection showed that these infants are more prone to minor disturbances

than their companions. The chief disturbances noted in the tuberculous infants were (1) slight daily elevations in temperature over a period of days or weeks, (2) irregular weight curves showing slow rate of gain, stationary weight or loss in weight over varying periods of time, (3) digestive disturbances and (4) susceptibility to infections. Under prolonged treatment in a preventorium these difficulties usually ironed themselves out. McCLELLAND, Cleveland.

DIAGNOSIS OF PULMONARY TUBERCULOSIS IN CHILDHOOD. P. LOWYS, Rev. méd.-sociale de l'enf. **5**:241 (July-Aug.) 1937.

Lowys describes several types of acute onset of pulmonary tuberculosis and cites cases in which the disease began with hemoptysis (a type that is rare in childhood), pleurisy, glandular involvement, phlyctenular conjunctivitis and illnesses resembling typhoid and rheumatic fever. Among the characteristic features of tuberculosis with an insidious onset he mentions low grade fever, loss of weight, ready fatigue, pallor and night sweats and cites exemplary cases. Several cases which were found in the course of routine physical examinations are cited as instances of tuberculosis with a "silent onset."

In his discussion of the elements of the diagnosis Lowys stresses the importance of the history and the frequency with which apparently healthy grandparents may be the source of devastating tuberculosis in childhood.

Perhaps too much space is devoted to the symptomatology of tuberculosis, symptoms of which are so often wanting.

His discussion of the physical examination in tuberculosis presents nothing new.

In order to effect a valid roentgenologic interpretation there should be a real liaison between the clinician and the roentgenologist.

The first place among the procedures for obtaining material for a bacteriologic examination is accorded rightly to gastric lavage. The value and significance of the tuberculin test are discussed.

Among the diseases mentioned as differential diagnostic possibilities are: enteric fever, rheumatic fever, endocarditis, respiratory infections of every sort, septicemia, urinary infection and syphilis. The paper concludes with mistakes in diagnosis due to various factors, which Lowys illustrates in twenty-four brief case histories.

DIETRICH, Beverly Hills, Calif.

ALLERGY TO TUBERCULIN IN ANIMALS TREATED WITH BCG. G. FRANCESCHELLI, Riv. di clin. pediat. **35**:700 (Aug.) 1937.

Rabbits and guinea pigs were vaccinated with BCG orally, subcutaneously and intravenously. When the vaccine was given by mouth allergy to tuberculin appeared between sixty and seventy-seven days later and had disappeared by the eighty-seventh day. When the vaccine was given subcutaneously or intravenously, the allergy appeared in about three weeks and persisted to the one hundred and forty-second day.

The Mantoux test proved much more sensitive than the Pirquet test, while tuberculins from BCG, from a bovine strain and from a human strain of tubercle bacilli all gave similar reactions in these studies.

The animals were not unfavorably affected by BCG even though they were pregnant or nursing. The new-born of the vaccinated rabbits reacted positively to tuberculin for about one month after birth but became negative subsequently.

In rabbits treated by BCG subcutaneously local tumors formed which showed caseation. The persistence of the allergy was probably due to these foci. The tumors contained acid-fast organisms, which when injected into another animal could be recovered in only one of fifteen cases.

When rabbits were given BCG subcutaneously on two occasions, the first nodule was not observed to be modified by the second. The second inoculation led quicker than the first to the appearance of the caseous nodule. HIGGINS, Boston.

IMPORTANCE OF THE TRYPTOPHAN TEST FOR THE DIAGNOSIS OF TUBERCULOUS MENINGITIS. R. PONGRATZ, München. med. Wchnschr. **84**:814 (May 21) 1937.

The tryptophan test differentiates tuberculous meningitis from all nonsuppurative meningitides and encephalitides. The tryptophan test is positive in the prodromal stage, often before bacilli can be demonstrated in the spinal fluid. The test is simple and requires little time.

BRAHDY, Mount Vernon, N. Y.

CONTAGION IN TUBERCULOSIS. G. A. M. HALL, Chinese M. J. **51**:905 (June) 1937.

The Peiping Tuberculosis Center has data showing the effect of familial contagion on the production of infection and disease by tuberculous contact. Families in China are large; the household is often visited by large numbers of relatives and servants, all of whom have intimate contact with the children. Custom and poverty tend to crowd the family together for sleeping.

Apprenticed young boys leave their homes to work, eat and sleep away from the family; there are long hours of work, poor feeding and overcrowding, which assist in the early breakdown of the man. He has to quit work and returns to his home, where he may disseminate the disease to his own family.

A table of figures shows the incidence of tuberculous infection in a group of persons with no known contacts in their families; in another group in which there is known to be familial tuberculosis but in which the tubercle bacilli are never found in the sputum; in a third group in which "open lesions" (positive sputum) exist in all the families. The percentage of tuberculosis in contacts of the families with positive sputum shows definite spread of the disease.

NEFF, Kansas City, Mo.

APPLICATION OF THE KAHN AND KLINE TESTS TO ANTICOMPLEMENTARY SERA FOR THE DIAGNOSIS OF SYPHILIS. S. N. TS'AO, Chinese M. J. **52**:69 (July) 1937.

An anticomplementary reaction of the blood serum in a Wassermann test interferes with confirmation of a diagnosis of syphilis. Ts'ao studied the incidence of such reactions and the behavior of the Kahn and of the Kline test on serums giving these reactions. Anticomplementary reactions occurred more frequently in serums from patients who had had antisyphilitic treatment than in those from persons not under treatment. Such reactions were observed much more frequently than was reported from the Mayo Clinic. The experience of Ts'ao confirmed that of other observers that blood from the umbilical cord of the new-born infant gives an anticomplementary reaction in a high percentage of cases. When the Kahn and Kline tests are used together, an anticomplementary reaction in the Wassermann test makes it possible to diagnose or exclude syphilis. The phenomena does not seem to be related to any pathologic condition.

NEFF, Kansas City, Mo.

TUBERCULOSIS IN CHILDREN, WITH SPECIAL REFERENCE TO THE CLINICAL SIGNIFICANCE OF GRADUATED INTRACUTANEOUS TUBERCULIN REACTIONS. T. K. WITH, Acta pædiat. **19**:482, 1937.

The conclusions which have been reached concerning the value of quantitative tuberculin tests in children are somewhat at variance with one another. Most authors agree that patients suffering from any of the forms of clinically active tuberculosis exhibit a more intense reaction to tuberculin than do those who harbor healed infections or those who are regarded simply as "healthy reactors." However, the diagnostic and prognostic value of graduated intracutaneous tests is still uncertain; little attention has been paid to the significance of the size and type of the reaction.

With performed quantitative Mantoux tests on 116 children whose reactions to tuberculin were positive. Many of them exhibited clinical manifestations of active tuberculous infection. He determined the minimum quantity of tuberculin required to produce a positive reaction and also made observations on the physical features of the cutaneous response, i. e., the relative amounts of erythema and induration. He found that the sensibility to tuberculin was greatest in children with primary infections, in whom the threshold value was usually less than 0.01 mg., that it was somewhat lower in those with tuberculous pleurisy, in whom the threshold value lay between 0.01 and 0.1 mg., and that it was lower still in those with healed primary tuberculous infection, in whom a reaction was obtained with amounts of tuberculin which varied between 0.1 and 1 mg. The lowest degree of allergy was encountered in children with miliary tuberculosis and in those with tuberculous meningitis; for such patients the minimum dose was 0.1 mg. or larger. In many cases serial tests were made. Little change in sensitivity was demonstrated during the course of the disease; however, several children showed considerable decrease in capacity to react toward tuberculin when retested between six months and one year after the initial examination. The relation of erythema to induration was not found to possess specific diagnostic or prognostic significance, although a predominance of erythema occurred in a small proportion of the recent primary infections.

McCune, New York.

Diseases of Blood, Heart and Blood Vessels and Spleen

An Approach to the Diagnosis of Congenital Heart Disease. T. J. Dry, Am. Heart J. **14**:135 (Aug.) 1937.

A classification of congenital heart disease is offered, based on the embryology and comparative anatomy of the heart. The diagnostic features of interventricular septal defect, interauricular septal defect, Lutembacher's disease, subaortic stenosis, pulmonary stenosis, the tetralogy of Fallot, patent ductus arteriosus, coarctation of the aorta and persistent right aortic arch are discussed. The prognosis in congenital heart disease is also considered.

Gibson, Chicago.

Apparent Increased Velocity of Blood Flow in Cases of Congenital Heart Disease with Septal Defects Having Right-to-Left Shunt. J. McGuire and F. Goldman, Am. Heart J. **14**:230 (Aug.) 1937.

The arm to carotid sinus circulation time determined by the sodium cyanide method of Robb and Weiss was employed in distinguishing between normal children and children with congenital heart disease. In eleven normal children the average time was 10.6 seconds; in five patients with cyanotic congenital heart disease the time was 12.1 seconds, and in three children with congenital heart disease with the clinical diagnosis of venous-arterial shunt the average time was 4.2 seconds. This rapid circulation time is probably diagnostic of venous-arterial shunt and should prove helpful in the diagnosis of congenital lesions of the heart.

Gibson, Chicago.

Climate and Rheumatic Heart Disease: Survey Among American Indian School Children in Northern and Southern Localities. J. R. Paul and G. L. Dixon, J. A. M. A. **108**:2096 (June 19) 1937.

The varying incidence of rheumatic heart disease in school children in different sections of this country affords a valuable method for determining the geographic prevalence of the disease. Because of the racial homogeneity of Indian school children as well as the stability of living conditions among them, groups of these children are favorable for such determinations. In the cold though relatively dry

climate of Montana and Wyoming rheumatic heart disease is prevalent in 4.5 per cent of Indian children in comparison with 2.2 per cent of Indian children in New England. In the warm though dry climate of southern Arizona it is low (0.5 per cent). Therefore, the disease is ten times as frequent among western Indians living in regions close to the Canadian border as in similar groups living close to the Mexican border. BONAR, Salt Lake City.

BASAL PERICARDITIS: A SIGN OF EARLY RHEUMATIC INFECTION. J. B. WOLFFE and V. A. DIGILIO, J. A. M. A. **108**:2101 (June 19) 1937.

Wolffe and Digilio interpret friction-like, at times somewhat musical, murmurs obtained in the majority of children manifesting one or several symptoms of rheumatism. They believe these murmurs to be the earliest sign of low grade childhood rheumatism and attribute them to pericarditis at the base of the heart, in the region of the origin of the great vessels. These sounds may be transitory and may disappear at any time following arrest of the disease, although they usually persist for years. Proper interpretation prevents making an unwarranted diagnosis of irreparable valvular disease in cases in which the cardiac condition has not progressed to a permanent pathologic state. BONAR, Salt Lake City.

DIFFERENTIAL DIAGNOSIS OF THE ANEMIAS IN INFANTS AND CHILDREN. R. B. ELDREDGE, Nebraska M. J. **22**:348 (Sept.) 1937.

Eldredge attempts to lay down rules for differentiating between the severe and the benign anemias. The most common cause of anemia in infants and children is infection. Hemolytic jaundice, sickle cell anemia and erythroblastic anemia, according to Cooley, belong in the same group. They have a racial, hereditary and familial incidence. They are all hemolytic. The anemia of new-born infants forms a fairly separate and distinct group, in which the most common condition is secondary anemia. Aplastic anemia forms another group. Schüller-Christian disease produces no diagnostic changes in the blood, while Niemann-Pick disease shows the typical foam cell and Gaucher disease the typical Gaucher cells. The leukemias, rare at birth and in infancy, are fairly common in older children. Von Jaksch's disease is a symptom complex which includes a group of disorders as yet unclassified. HAMILTON, Omaha.

EFFECT OF INDOL ON HEMATOPOIESIS IN DOGS FED DEFICIENT DIETS. C. P. RHOADS, Proc. Soc. Exper. Biol. & Med. **36**:652 (June) 1937.

Dogs fed on a diet which caused black tongue presented severe and often sudden anemia when given 1 Gm. of crystalline indol daily. The same amount of indol given to a dog on a normal diet was without effect. The administration of liver extract cured and prevented the anemia. HANSEN, Minneapolis.

EFFECT OF DIET ON SUSCEPTIBILITY OF CANINE HEMATOPOIETIC SYSTEM TO DAMAGE BY AMIDOPYRINE. C. P. RHOADS and D. K. MILLER, Proc. Soc. Exper. Biol. & Med. **36**:654 (June) 1937.

The fact that the administration of aminopyrine is associated with the occurrence of acute agranulocytosis in human beings, plus the fact that leukopenia occurs with certain dietary deficiencies, suggested that these two procedures may be productive of abnormal hematopoiesis. Seventeen dogs were used in the study. When 0.5 Gm. of aminopyrine was fed daily to dogs on a black tongue-producing diet, anemia appeared in from eight to thirty-five days. No such anemia appeared when the diet was normal. The anemia can be prevented and cured by the administration of autolyzed yeast. The anemia is associated with a suppression of maturation of hematopoietic bone marrow cells. HANSEN, Minneapolis.

THE ARTERIAL PULSE IN HEALTH AND DISEASE (LUMLEIAN LECTURE). C. BRAMWELL, Lancet **2**:239 (July 31) 1937.

This is a rather comprehensive article. Among the topics considered are pulse frequency, the influence of age on the pulse rate, various arrhythmias and the condition of the arterial wall.

In speaking of bradycardia Bramwell refers to his examination of twenty-eight marathon runners at the Olympic games in 1928. Their average heart rate was 58 beats per minute; that of sprinters was 66.

The pulse rate steadily falls throughout childhood and adolescence, while during the later period of life it tends to rise slightly. The transition from slowing to quickening does not occur until the twenty-fifth year.

Among the tests for assessing cardiovascular efficiency, the pulse response test and the 40 mm. test were considered the best.

LANGMANN, New York.

TRANSFUSION OF STORED CADAVER BLOOD. V. N. SHAMOV, Lancet **2**:306 (Aug. 7) 1937.

This study, which comes from the United Soviet Socialist Republics, records the successful use of blood from a cadaver in forty-two cases. Shamov subscribes fully to the enthusiastic support given to this method of Yudin.

Further studies should be made of the biochemical changes in the blood after death.

LANGMANN, New York.

TRANSFUSIONS OF STORED CADAVER BLOOD. S. S. YUDIN, Lancet **2**:361 (Aug. 14) 1937.

This is a report on the experiences in the first thousand cases in Moscow. Blood is withdrawn from the jugular vein via two glass cannulas, one pointing craniad, the other inserted into the right auricle, the body being in the Trendelenburg position. Blood is never withdrawn later than from six to eight hours after death—generally from two to four hours—and bodies showing no injury or only slight injury are used, e. g., those in which death resulted from angina pectoris or from electric shock. The average yield is from 1.5 to 2.5 liters of blood. The blood is citrated.

Five fatal complications were encountered in the thousand cases, all due to conditions arising through serious errors of technic—in two instances to hemolysis due to incompatibility of the blood groups, in a third to avertin narcosis, and in the other two to hemolysis probably from incompatibility of the blood groups. Two more deaths are also mentioned, one due to air embolism and the other to anaerobic infection at the site of venesection.

The few serious complications were eclipsed by the large number of good results. The advantages cited for the cadaveric blood are that it can be stored and introduced without any anticoagulants and that it can be prepared in large quantities and made available for immediate use in emergencies.

LANGMANN, New York.

SULPHÆMOGLOBINAEMIA: ITS CAUSE AND PREVENTION WITH SPECIAL REFERENCE TO TREATMENT WITH SULPHANILAMIDE. H. E. ARCHER and G. DISCOMBE, Lancet **2**:432 (Aug. 21) 1937.

In a large majority of the cases that have been reported sulfhemoglobinemia and methemoglobinemia were associated with prolonged or otherwise excessive ingestion of drugs derived from aniline or nitrobenzene.

The mechanism by which methemoglobin is produced in these cases is not yet understood. That of the production of sulfhemoglobin is known: Hydrogen sulfide is constantly absorbed from the large intestine, being formed therein by the action of bacteria on food residues or as the result of the administration of elementary sulfur. This absorbed hydrogen sulfide under normal conditions is partly destroyed by the plasma and partly excreted by the lungs. If a grossly excessive amount

of hydrogen sulfide is formed, or if a normal amount is formed when a catalyst for the combination of hemoglobin with hydrogen sulfide is present in the blood, some of the sulfide will combine with the hemoglobin in the erythrocyte; and since this cell, which has a life of several weeks, is not lysed, in the course of time a detectable sulfhemoglobinemia will develop. Sulfanilamide is such a catalyst.

It is highly probable that all drugs containing the group $C_6H_5N<$ are capable of causing methemoglobinemia and of facilitating the production of sulfhemoglobin.

The action of magnesium sulfate in accelerating the production of sulfhemoglobinemia is less easy to understand and is probably due to the formation of a liquid stool, less food being absorbed, rather than by the reduction of the sulfate. The aim in treatment should be not alone to abstain from purges but to maintain the colon as free as possible from food residues and water, so that bacterial decomposition may be reduced to a minimum. A diet with a low residue is prescribed. If purges have been given, it is important to cleanse the colon with an enema before treatment is started. Liquid paraffin is given daily. Acetophenetidin should not be given.

In treatment with sulfanilamide, it is important to examine spectroscopically the blood of all patients in whom cyanosis develops, for occasionally the cyanosis is due not to abnormal pigments in the blood but to the development of some organic disease, such as pneumonia.

LANGMANN, New York.

SPLENIC INFANTILISM. M. SENDRAIL and J. LASSERRE, Arch. de méd. d. enf. **40**:489 (Aug.) 1937.

Sendrail and Lasserre discuss a specific type of infantilism, heretofore unclassified and distinguished by its essentially splenic origin. Previously Lehndorff, of Vienna, described a form which he designated as hematic infantilism, but the nearest approach to the variety noted in the present paper was that reviewed by Apert and tentatively classified as splenohepatic infantilism.

Following an extended consideration of the adenosplenic and the hepatosplenic type, the authors select three pathologic conditions to represent the syndrome which they designate as splenic infantilism. To the first group, they assign the parasitic splenomegalies; to the second, the reticuloendothelioses, such as Gaucher's disease and the Niemann-Pick disease; the third class includes the splenic anemias.

Under the last grouping they report a case of Cooley's disease in detail.

AMESSE, Denver.

CONGENITAL HEART BLOCK WITH DEFECT OF INTERVENTRICULAR SEPTUM. PAVEL LUKL, Časop. lék. česk. **74**:1344 (Nov. 29) 1935.

The criteria for diagnosis of congenital heart block are (1) bradycardia in infancy, (2) congenital and developmental defects, (3) the absence of infectious disease in infancy and (4) attacks of syncope. The author presents a case in detail, with electrocardiographic and roentgenologic findings. The difficulties in differentiation between congenital and acquired cardiac disease are stressed. The combination of block with septal defect is extremely rare and is explained on an embryogenetic basis. The interesting findings were systolic murmur and thrill, which were demonstrable with a Bock differential stethoscope over practically the entire chest and over the extremities.

STULIK, Chicago.

FETAL ENDOCARDITIS. F. BARTÁK, Časop. lék. česk. **74**:1400 (Dec. 13) 1935.

Detailed reports are given of 4 cases, of which 2 are of fetal endocarditis in the newborn, 1 of functional hyperplasia of the heart in an infant of 10½ months and 1 of acute myocarditis in an infant of similar age. A histologic study of 5 human embryos under 5 months of age was made for additional information. So-called fetal endocarditis includes both inflammatory processes and frank congenital defects, the first group covering toxic and infectious myocarditis and myoendocarditis and the second myxomatous endocardial hyperplasia. Only those

cases in which sclerosis of the endocardium is found at birth should be classed as instances of fetal endocarditis. To make a correct diagnosis of primary endocarditis, defects in the subendothelial layers must be demonstrated microscopically, and a simple anatomic diagnosis is not conclusive. No inflammatory reaction was found in the histologic picture of the fetal heart, so that more than likely the infectious process develops late in pregnancy. In practically all cases primary fetal endocarditis has been myoendocarditis caused either by syphilis or by some other toxi-infectious agent or by a congenital anomaly manifested as a hyperplasia of the myxomatous tissue of the endocardium. STULIK, Chicago.

A CASE OF APLASTIC ANEMIA. T. OKAMOTO and N. SATA, Orient. J. Dis. Infants **21**:403 (May) 1937.

The authors report a case of aplastic anemia in a boy 8 years and 5 months old, whose erythrocyte count ranged from 520,000 to 648,000, with the leukocyte count varying between 3,400 and 4,400. The water content of the blood was 92.5 per cent; the sedimentation rate was markedly increased. The child's blood was of type AB, as was that of the parents. Autopsy is not recorded.

KATO, Chicago.

THROMBOCYTOPENIC PURPURA (MORBUS MACULOSUS WERLHOFII) IN THE FIRST YEAR OF LIFE. J. STRÖM, Acta pædiat. **19**:540, 1937.

The history of two cases of thrombocytopenic purpura in infants is related. The first case was that of a 4 month old boy in whom the disease was manifested by melena, petechiae in the skin and mucous membranes and a decrease of the concentration of platelets to 48,000 per cubic millimeter. The second was that of a 7 month old girl who also showed melena and bleeding beneath the integument; the lowest concentration of platelets was 61,000. The disease remained active after eighteen months and was regarded as chronic. The hematologic findings in both cases were characteristic of Werlhof's disease. Reports of five cases of congenital thrombocytopenic purpura have been published. In two of the cases the mother suffered from the same disease, and in a third the mother exhibited thrombocytopenia without clinical symptoms. An additional case in a newly born infant has been described, and four others in infants less than 1 year of age. A tabular summary of these cases is included, and a useful bibliography is appended.

MCCUNE, New York.

Diseases of Nose, Throat and Ear

INCIDENCE AND SIGNIFICANCE OF HEMOLYTIC STREPTOCOCCI IN THE THROATS OF CHILDREN. C. M. BURPEE, Arch. Pediat. **54**:470 (Aug.) 1937.

Cultures were taken from the throats of 148 white and 152 colored children and 63 nurses and doctors at intervals of two weeks over a period of one year. The average incidence of carriers of Streptococcus haemolyticus was 11.1 per cent among the patients and 6 per cent among the members of the staff. There was a higher incidence of positive cultures for patients with tonsils. The incidence of positive cultures was higher for white than for colored patients.

The incidence of Str. haemolyticus in patients in a pediatric ward can be controlled within certain limits. The incidence of Str. haemolyticus in the throats of the members of the staff was not definitely related to that in the throats of the patients.

The incidence of Str. haemolyticus in the pediatric ward showed seasonal variations. The percentage of carriers was highest in November, December, February and July, and this observation seemed to be independent of the illnesses prevailing at these times. Burgin and Higgins found the greatest incidence in November and March.

ORR, Buffalo, N. Y.

SOME OBSERVATIONS ON ERRORS MADE IN THE DIAGNOSIS AND MANAGEMENT OF EAR, NOSE AND THROAT CONDITIONS. J. W. JERVEY JR., J. South Carolina M. A. **33**:189 (Aug.) 1937.

Otolaryngologists make mistakes but do not make as many as do general practioners. Jervey advises that paracentesis of the ear should be carried out with the patient under general anesthesia, preferably from chloroform. Routine examination of the ears is emphasized, as otitis is often overlooked by the practitioner. It is best not to irrigate the ears but to clean them out with a sterile swab.

Diphtheria should always be kept in mind when a membrane is present in the throat. Lesions about the upper lip should be treated with hot fomentations. In selected cases submucous resection aids considerably. Many opaque antrums clear up under alternate spraying with cocaine and epinephrine solution. Foreign bodies in the nose and throat should be handled by the expert. Jervey emphasizes the possibility of an abscess of the brain which might appear as a surface lesion.

WESTON JR., Columbia, S. C.

HARD OF HEARING SCHOOL CHILDREN. C. T. UREN, Nebraska M. J. **2**:300 (Aug.) 1937.

The first step in a program for management of school children who are "hard of hearing" is the detection of the hearing defects. With a 4-A audiometer, as many as forty children can be tested at one time and in about twenty minutes. The average number of hearing defects runs between 60 and 140 per thousand children. The second step is a visit to the parents of the child with a hearing defect by the school nurse to talk over the situation. The third step is that of sending the child somewhere for medical help. Often the parents are unaware that the child has a hearing defect. Only 37 per cent of parents in the series examined in Omaha knew that their children's hearing was defective. Now 400 underprivileged children are being examined in the offices of 15 otologists in Omaha. About 50 per cent of these children are in need of tonsillectomy and adenoidectomy. A program of this type is not complete without proper instruction in lip reading and speech correction. Lip reading will better enable the "hard of hearing" child to remain in school. Mechanical aids when indicated should be advised, but lip reading should not be neglected in those who are helped by hearing devices.

HAMILTON, Omaha.

INDICATIONS AND CONTRAINDICATIONS FOR TONSILLECTOMY AND ADENOIDECTOMY. T. M. GOODWIN, West Virgina M. J. **33**:250 (June) 1937.

The indications that justify tonsillectomy and adenoidectomy are:

1. Repeated attacks of acute tonsillitis or peritonsillar abscess
2. Continuous head colds
3. Obstructive nasal breathing (adenoids)
4. Cervical adenitis if due to tonsillar infection
5. Hypertrophy of tonsils if this is sufficient to impede respiration and the swallowing of food
6. History of acute catarrhal or suppurative otitis media
7. Mouth breathing
8. Repeated attacks of pharyngitis, laryngitis or bronchitis
9. History of rheumatism, endocarditis, chorea or nephritis
10. Tonsils proved to be carriers of diphtheria
11. Tuberculous infection of the tonsils—with great care in the selection of cases
12. Continuous discharge from the nose in absence of sinusitis
13. "Buried" tonsils with definite evidence of disease

The contraindications are:

1. Acute tonsillitis within a period of two weeks
2. Convalescence from serious illness
3. Hemophilia or other blood dyscrasia
4. Active syphilis or tuberculosis
5. Menstruation occurring just before or during period of operation
6. Chronic arthritis with joint changes
7. Anomalous arteries in or near the tonsils
8. Hypotension of 200 or more
9. Cardiac involvement—calls for choice of time and anesthetic and a consultation
10. Exposure to infectious disease—calls for delay
11. Lesion in the mouth
12. Sinus or nasal disease must be cleared up
13. Loose teeth—must be extracted before operation
14. Marked anemia or delayed clotting time
15. Persistent thymus or acidosis.

SHAWKEY, Charleston, W. Va.

ACUTE OTITIS MEDIA AND MASTOIDITIS: THE INDICATIONS FOR OPERATION. I. S. HALL, Edinburgh M. J. **44**:298 (May) 1937.

This paper is the thirteenth contribution on "Clinical Recollections and Reflections" which have been running in the *Edinburgh Medical Journal*. It deals with the definition and treatment of acute otitis media. In answer to the question whether it is justifiable to perform paracentesis because of safety from the possible production of mastoiditis the author quotes figures from the Royal Infirmary: Of 221 patients who had the ear drum punctured, 28 had a mastoid operation subsequently, which Hall considers a small proportion. In 189 on whom mastoid operations were performed, only 28 had previous paracentesis.

The restoration or maintenance of hearing should be considered in any operative procedure on the ear. A purulent discharge over a long period causes damage to the hearing. Mastoid operation should shorten the period of suppuration and therefore the return of the middle ear to health and function.

Increasing toxemia, a rising pulse rate and periosteal edema are evidences of advancing infection. Tenderness over the mastoid is not always a reliable symptom. Throbbing pain or unilateral headache deserves constant consideration. The x-ray picture may help greatly in interpreting local signs.

Hall considers that operation on the mastoid is indicated (1) when infection spreads outside the mastoid; (2) when there are intracranial symptoms; (3) when there has been continued purulent discharging for as long as five weeks, even in the absence of other symptoms; (4) when toxemia is associated with pain after paracentesis or (5) when in the presence of such symptoms the ear has stopped discharging. Increasing deafness accompanying copious discharge in a case of known mastoid disease also calls for operation.

NEFF, Kansas City, Mo.

REMOVAL OF TONSILS BY SHORT WAVE COAGULATION. V. FRÜHWALD and L. H. STIEBÖCK, Wien. klin. Wchnschr. **50**:1038 (July 9) 1937.

Since 1931 Frühwald and Stieböck have experimented with electrocoagulation of tonsils. At first they employed diathermy but during the last two years they have adopted treatment by short waves. Coagulation by diathermy was found to cause irritation and pain, even when cocaine was given, and in some cases there was a faradic reaction.

Short-wave treatment has proved very successful. It is recommended especially when advanced age, disease of the heart or kidneys or a tendency toward hemorrhage makes operation dangerous. Also it is advantageous when the patient cannot

conveniently leave work for hospitalization or when a surgical operation on the throat would cause scar tissue that might deplorably damage the voice, as in a singer.

The throat is anesthetized with a 20 per cent cocaine solution. The tongue is held back with a wooden spatula, and the electrode is applied to the tonsils in several places. The treatment takes only a few seconds and is much more effective than diathermy. The authors recommend treatment of one tonsil at a time, with an interval of a week between treatments, until the entire growth has been removed. The coagulation serves to close the blood vessels and thus prevents both bleeding and infection. The patient requires a soft diet. As a gargle, lukewarm marshmallow tea is recommended.

A. F. Abt, Chicago.

Tonsillectomy by Short Wave. L. H. Stieböck, Wien. klin. Wchnschr. **50**:1039 (July 9) 1937.

Stieböck explains that the apparatus used in the treatment in question has an efficiency of 1.5 kilowatts. This gives continuous vibrations up to 50,000,000 a second, and the rays are from 4 to 8 meters in length, depending on the frequency.

A newer 200 watt "superfrequency" unit can produce from 500,000,000 to 1,000,000,000 oscillations per second and rays with a length of from 80 to as low as 32 cm., with a comparative increase in therapeutic value.

Diathermy, on the other hand, produces rays with a length of 300 meters and a frequency of only 1,000,000 per second. In diathermy and other bipolar methods the patient is included in the circuit, but in the short wave treatment, which is unipolar, the energy is applied only to a given area. This rules out the possibility of uncontrolled flow of current and consequent shock.

In tonsillectomy, as well as in treating papillomas, condylomas and other growths by the means described, the short waves exert a beneficial caloric effect, although this warmth, it should be expressly noted, is to be studiously avoided under other circumstances.

Stieböck hopes to be able with the superfrequency treatment to relieve stenocardiac complaints. In collaboration with O. Förster, Vienna, he perfected another invention, which will release positive ions and ground them by way of affected tissues. This "anode" or "positive pole" therapy has been used successfully in the treatment of various patients with eczema and joint involvement.

A. F. Abt, Chicago.

Diseases of Lungs, Pleura and Mediastinum

Bronchiectasis: An Analysis of Its Causes. P. M. Andrus, Am. Rev. Tuberc. **36**:46 (July) 1937.

In this monographic paper, Andrus has set forth in detail his studies on the physical forces supposed to be causes of acquired bronchiectasis. He eliminates the following agents as not laying any clearly significant or frequent dilative stress on the bronchi: negative pressure of the pleural space, cough, pressure of contained secretions, partial bronchial obstruction, physiologic dilatation of the bronchi, retraction of scar tissue and destruction of tissue without dilating stress.

On the positive side he concludes that the most satisfactory explanation of bronchiectasis is provided by the direction and intensity of clinicopathologic forces arising as a result of pulmonary atelectasis. His studies corroborate the opinion that both infectious injury to the bronchial wall and an abnormal mechanical dilating stress are customarily necessary for the production of bronchial dilatation. He points out also that the disease is usually characterized by ectasia of both the bronchi and the respiratory air sacs, and he recommends the term "pulmonectasis" as describing more adequately the anatomic situation.

Eugene Smith, Ogden, Utah.

CLINICAL RECOLLECTIONS AND REFLECTIONS: THE TREATMENT OF ACUTE PLEURAL EMPYEMA. W. J. STUART, Edinburgh M. J. **44**:446 (July) 1937.

Stuart recommends closed drainage just as soon as a diagnosis of empyema is proved, whatever the type of micro-organism. Delay in beginning adequate drainage results in discomfort from repeated aspirations, long drawn out danger from constant presence of pus and interference with functions of the lungs, such as expansion.

The details emphasized are local anesthetization, a preliminary incision through the skin and a stab plunge of the trocar and cannula into the pleural cavity, which is sufficiently filled with pus to protect the lung from damage by the trocar. The technic of the later care as to dressings and drainage is discussed. A smaller apparatus is described for use in the very young child. The apparatus is listed in detail.

Rapid convalescence with little or no mortality is assured, even in streptococcic cases.

NEFF, Kansas City, Mo.

ARTIFICIAL PNEUMOTHORAX IN THE TREATMENT OF ACUTE PNEUMONIA. V. T. J. LYNCH, M. J. Australia **2**:355 (Aug. 28) 1937.

In three cases of pneumonia reported by Lynch pneumothorax was of value in bringing about rapid amelioration of symptoms of distress, lowering the temperature, reducing the toxemia and hastening recovery. He reiterates the rules governing pneumothorax in the treatment of pneumonia: (1) The lapse of time since the onset of pneumonia must be under three or four days; (2) the consolidation must be confined to one lung; (3) there must not have been evidence of cardiovascular disease.

GONCE, Madison, Wis.

TREATMENT OF NONTUBERCULOUS PURULENT PLEURISY ASSOCIATED WITH RETROPARIETAL RESIDUAL CAVITY. AKIF CHAKIR, Arch. de méd. d. enf. **40**:579 (Sept.) 1937.

Since early pleurotomy with closed drainage has been adopted in the treatment of empyema in childhood, one rarely encounters a pleural fistula communicating with a residual cavity. When such a condition is found, thoracoplasty is indicated to prevent otherwise inevitable scoliosis.

The author reports in detail the history of two cases observed at the surgical clinic of the University of Istanbul, Turkey, that of a boy of 7 years and that of a girl of 10 years, in which repeated thoracoplasty failed to produce satisfactory results.

The first patient after three operations had pronounced scoliosis when admitted to the clinic; there were four fistulas with abundant purulent discharge, the first one having followed a pleurocostotomy four years before. The cavity extended from the base of the left lung to the border of the third rib; moderate but continued fever was reported.

After a brief period in the hospital, during which efforts to improve the child's resistance were made, a costal resection, extending from the ninth to the fourth rib, was done under anesthesia with tribromethanol in amylene hydrate. The extraparietal pocket and the residual intrapleural cavity being filled with pus, suitable disinfection was practiced for twenty days; the cavity was then much smaller; it was clean; granulations were abundant and the wound nearly closed. Eight weeks later, however, an injection of iodized poppyseed oil revealed the persistence of a residual intrapleural cavity; the number of fistulas had been reduced to two.

Two months after the first thoracoplasty the ribs were again resected, and a novel method, hitherto unreported, was used to close the existing cavity: The muscles of the scapular apex were detached at their insertion; the scapula was

resected as far as the spine, and the mass of muscle tissue incorporated in the cavity, after free scarification of the fibrous membrane which incarcerated the lung.

A similar operation was done in the second case. After the complete closure of the wound, respiratory and gymnastic exercises were employed to correct the scoliosis.

AMESSE, Denver.

PULMONARY CYSTIC IMAGE GRADUALLY DISAPPEARING IN INFANT FOUR MONTHS OLD. PIERRE LEREBOULLET, MARCEL LELONG and JEAN BERNARD, Bull. Soc. de pédiat. de Paris **34**:77 (Feb.) 1936.

A boy 4 months old was admitted to the hospital acutely ill. Roentgenologic examination revealed a large ovoid air-containing cavity which was sharply outlined in the lower posterior part of the left side of the chest and a small area of bronchopneumonia in the upper lobe of the left lung. The ovoid image did not change for two months. It then began to shrink concentrically, until it disappeared a month later. Encysted pneumothorax, diaphragmatic hernia and congenital air cyst were ruled out, and the most likely diagnosis was acquired air cyst or emphysematous bulla. It is pointed out that a congenital pulmonary air cyst cannot be diagnosed with certainty from one roentgenogram, repeated examinations over a sufficiently long period must be made to confirm its permanence.

BENJAMIN, Montreal, Canada.

CLINICAL AND PROGNOSTIC OBSERVATIONS CONCERNING SPONTANEOUS PNEUMOTHORAX IN COURSE OF NONTUBERCULOUS PULMONARY DISEASES. J. J. BINDSCHEDLER, Bull. Soc. de pédiat. de Paris **34**:453 (July) 1936.

Spontaneous pneumothorax in children occurs as a result of tuberculosis, or of acute pulmonary or pleural disease and in the so-called idiopathic type, which includes rupture of an emphysematous bulla, scar, vesicle or cyst. Marked variability of pathogenesis and course renders the prognosis variable according to the conditions present. Grossly, about two thirds of the children in whom this cannot be diagnosed with certainty from one roentgenogram; repeated examina-

BENJAMIN, Montreal, Canada.

FRESH AIR TREATMENT OF BRONCHOPNEUMONIA IN CHILDREN. R. DEGKWITZ, München. med. Wchnschr. **84**:102 (July 2) 1937.

Degkwitz compares the mortality rates in two groups of children with bronchopneumonia. The first group, comprised of 334 patients, was treated before the fresh air treatment had come into use or at a time when it was used inadequately. In the second group, with 424 patients, the fresh air treatment was used. Degkwitz states that the groups were similar in reference to age range, type of case and frequency of complications. Each group received indispensable nursing care and medication. However, the first group was treated in the wards, whereas the second was treated on open air verandas or in rooms in which the windows were kept open. Some in the second group were alternated between the open veranda and a room with steam-saturated warm air. None of the children in the second group remained constantly in bed but were carried around for from four to five hours daily. Patients whose deaths occurred within two days of their hospitalization are not included in either group.

Of particular importance in treatment is the administration of sufficient fluids, the proper position in bed and frequent change in position. The pillow should be flat to enable proper use of the respiratory muscles. Circulatory embarrassment should be treated with caffeine, camphor or other stimulants.

The mortality rate in the first group was 47.4 per cent, whereas the rate in the second group, treated with fresh air and with frequent change in position, was only 19.4 per cent. The ratio pertaining to pneumonia complicating measles was the same as that pertaining to pneumonia complicating other diseases.

Patients with pneumonia breathe deeper and slower and sleep better in the open. Only the patients whose disease is severe, with apathy, pallor, small pulse and poor superficial circulation, do not respond to the fresh air treatment.

BRAHDY, Mount Vernon, N. Y.

Diseases of the Gastrointestinal Tract, Liver and Peritoneum

INTUSSUSCEPTION DUE TO INTESTINAL TUMOR. F. A. FISKE, Ann. Surg. **106**:221 (Aug.) 1937.

Intussusception may be classified into a primary or a secondary group from the causative pathologic condition or into an acute, a chronic or a recurrent group from the clinical picture. The primary intussusception usually has an acute onset, occurs at the iliocecal region and chiefly in infancy and, once reduced, rarely recurs. A gross causative pathologic background is seldom found. The secondary intussusception usually has a chronic or a recurrent onset, occurs in adults and older children and tends to recur if the causative pathologic condition is not removed. Recognition of these two groups is of practical clinical importance since on this knowledge depends the choice of a surgical procedure which will affect a cure.

Fiske reports four cases of intussusception due to tumors of the intestines.

BANTIN, Omaha.

ACUTE APPENDICITIS IN CHILDREN. P. D. ALLEN, J. A. M. A. **109**:121 (July 10) 1937.

A study was made of 612 cases of acute appendicitis. The disease becomes more frequent with each additional year of age in children, but is comparatively infrequent in those under the age of 5. The morbidity and mortality are increased by prolonged illness before operation. The high death rate in infants is the result of the occurrence of spreading peritonitis, to which infants offer little resistance. Perforation is hastened by the use of cathartics. When drainage is expected to be profuse, suturing of only the peritoneum prevents sloughing of fascia and muscles. It also provides more adequate drainage and tends to decrease the incidence of hernia. This report, as compared with a similar report made a few years ago, reveals a lessened death rate among infants.

BONAR, Salt Lake City.

CONGENITAL HYPERTROPHIC PYLORIC STENOSIS IN INFANCY. E. J. DONOVAN, J. A. M. A. **109**:558 (Aug. 28) 1937.

Congenital hypertrophic pyloric stenosis occurs seven times more often in boys than in girls. The first symptom is vomiting, which usually begins between the second and fifth weeks. The tumor mass is pathognomonic of the condition and may be felt in every case. The most satisfactory treatment is the Fredet-Rammstedt submucous pyloroplasty, which gives a permanent result. In the 193 cases reported there were no deaths. In reducing the mortality the most important factor was the preoperative preparation, which consisted chiefly in supplying fluids and blood.

BONAR, Salt Lake City.

HEPATOMEGALY. ? CAUSE. G. H. NEWNS, Proc. Roy. Soc. Med. **30**:1069 (July) 1937.

A case was reported in a boy of 5½ years. The child had always had a large abdomen, and for the last six months he had been growing thinner and suffered from breathlessness on exertion. The family history and the results of the physical examination and other investigations are given in the report.

WILLIAMSON, New Orleans.

THE HAEMOPOIETIC ACTIVITY OF THE HUMAN LIVER. JOHN F. WILKINSON, LOUIS KLEIN and CHARLES A. ASHFORD, Quart. J. Med. **6**:143 (April) 1937.

Extracts were prepared of the livers of 4 patients with achrestic anemia, 3 with aplastic anemia and 1 with pernicious anemia. The hemopoietic potencies of these extracts were then tested in cases of typical pernicious anemia.

The extracts from patients with achrestic anemia proved as effective as those made from normal human liver or from calf liver. The extracts from the livers of patients with aplastic anemia were equally effective. No hemopoietic effect resulted from the use of an extract made from the liver of a patient with untreated pernicious anemia. BRADFORD, Rochester, N. Y.

PRIMARY EPITHELIOMA OF THE LIVER IN AN INFANT OF THREE MONTHS. MME. CONDAT, J. GADRAT and J. Lasserre, Arch. de méd. d. enf. **40**:521 (Aug.) 1937.

Primary epithelioma of the liver in early life is more common than sarcoma. Steffen's report of sixty-seven cases included forty-two cases of carcinoma and twenty-five of sarcoma.

The authors of the present article report a case in a male infant 3 months of age. The baby was seized with high fever, meningismus and obstinate constipation. On examination the abdomen was found greatly distended, and the most careful palpation failed to delimit the spleen and the liver; a voluminous tumor filled the entire abdomen. The condition of the patient became aggravated, and laparotomy showed the growth to have its origin in the liver. Death followed the operation in a few hours. The autopsy revealed a neoplasm of the left lobe of the liver, weighing 610 Gm., which histologic examination showed to have all the characteristics of carcinoma. There were no metastases. AMESSE, Denver.

CHRONIC ILEUS FOLLOWING ENCAPSULATING PERITONITIS PROBABLY OF CONGENITAL ORIGIN. R. STOOP, Arch. de méd. d. enf. **40**:588 (Sept.) 1937.

A girl 5 years old had complained of intermittent abdominal pain since early infancy; she had constipation of an aggravated type, frequently going for several days without a bowel movement. In her fourth year she sustained a more violent attack of pain and fecal vomiting and was hospitalized. Rectal irrigations were employed, with successful results. The following year pulmonary complications were noted, and examination, roentgenologically and through lavage of the stomach, showed tuberculous involvement at the hilus of the right lung. Only two small tumors in the right side of the epigastrium could be perceived by palpation, but examination following a barium meal and a barium enema revealed dystrophy of the cecum, with marked torsion of the colon. The patient was taken to a seaside resort and after one year was discharged in good general health. When she returned home, the author saw her for the first time. He was at once struck by her peculiar gait, which resembled that of a goose. The child maintained that she could walk in no other way, on account of pain in the abdomen. Within a week she was seized with a violent attack; there was fecal vomiting, accompanied with constipation, and examination showed absence of peristalsis. In consultation it was decided that laparotomy was justified. On operation the cecum was found to be on the left side; the ileum was spastic; the loops were irregular and difficult to follow; the mesentery contained several large noncalcified glands, and the veins were greatly engorged. This congestion was difficult to interpret at the moment, but when the incision was enlarged, a sac was discovered enclosing the upper portion of the small intestine and a considerable part of the colon. The membrane was firm and was attached to the mesentery. Torsion of the small intestine was relieved; the sac was removed, and the injection of the mesenteric veins immediately disappeared. The patient made a prompt recovery and has remained in excellent health. Several cases involving a similar condition have been reported in the Netherlands, the etiologic cause in most instances being a congenital malformation. AMESSE, Denver.

ROENTGEN DIAGNOSIS OF HYPERTROPHIC PYLORIC STENOSIS IN THE INFANT. J. JOCHIMS, Ztschr. f. Kinderh. **58**:796, 1937.

Determination of gastric motor function by roentgen examination may be misleading in the diagnosis of pyloric stenosis. Demonstration of actual stenosis, on the other hand, is much more accurate. Jochims describes and illustrates a simple technic which he has used with good results in 74 cases. Filling of the small intestine is regarded as of equal importance with the condition of the pyloric canal. A picture typical of pyloric stenosis shows elongation of the pyloric canal and lack of, or slight emptying into, the duodenum ten or fifteen minutes after ingestion of the contrast meal.

SIEMSEN, Chicago.

HEPATIC FUNCTION AND LIVER EXTRACT. Y. HIRATA, Orient. J. Dis. Infants **21**:11 (March) 1937.

The lowered glycogenetic function of the liver resulting from parenchymatous injury of the hepatic cells may be completely circumvented by administration of liver extract. When the storage by the liver of sugar is disturbed by intoxication it can be restored by injection of liver extract. The same is true of degeneration of the hepatic cells. The function of the reticulo-endothelial system appears to respond favorably to liver therapy.

KATO, Chicago.

THREE CASES OF ATRESIA OF THE DUODENUM. E. PERMAN, Acta pædiat. **19**:557, 1937.

In 1922 Davies and Poynter collected from the literature 401 cases of atresia of the intestinal tract. In 35 per cent of these the duodenum was the site of the atresia, the ileum and cecum in 25 per cent, the jejunum in 15 per cent and the colon in 10 per cent; in 17 per cent of the cases the atresia was multiple. Of the 134 cases of atresia of the duodenum, the obstruction lay proximal to the ampulla of Vater in 44 per cent and distal thereto in 56 per cent. The cardinal feature of atresia of the intestinal tract is vomiting; constipation is usually present. The time of onset of the manifestations, as well as the character of the vomitus and of the stools, depends on the site of the atresia. Roentgenographic examination is frequently useful in confirming the diagnosis, although sometimes the roentgen features may be confusing. Entero-enterostomy is the operation of choice in most cases. It should be carried out under local anesthesia. In view of the facts that the anatomic situation may be exceedingly complicated and that the points of obstruction may be multiple, the whole intestinal tract should be inspected carefully, with as little trauma as possible. Nine cases in which operation was successful have been reported. The author describes in detail three cases of duodenal atresia. Two of the patients were girls and one a boy. In all cases the vomiting began shortly after birth. Gastro-enterostomy was carried out in two cases; in the third case plastic measures were not attempted because of the multiplicity of the lesions. Two of the patients died; one recovered. One of the fatalities was due to hemorrhage from the umbilical vessels, which had been unwittingly severed at operation. The moral is drawn that incision should always be made to one or the other side of the midline. A useful bibliography is provided.

MCCUNE, New York.

Nervous Diseases

INFANTILE CEREBRAL PALSY: ITS TREATMENT BY SELECTIVE INHIBITION OF SENSORY STIMULI. E. R. CARLSON, Ann. Int. Med. **11**:324 (Aug.) 1937.

Carlson contends that in the treatment of infantile cerebral palsy consideration should be given to the sensory side of the reflex arc, instead of devoting one's attention entirely to the correction or improvement of physical defects. The effect of selective inhibition of sensory stimuli is illustrated by citing instances

of spastic children who were unable to perform such simple acts as feeding themselves and yet were able to perform creditably at golf, on the piano and in the laboratory.

The normal summation of visual, auditory and proprioceptive stimuli by the cerebral cortex in the case of the child with cerebral palsy is overwhelming and results in excessive muscular activity. A shunting of one or more sensory stimuli will affect the cortex in degrees and thus the final release will be somewhat more toward the normal.

A plea is made for the education of these children in a manner to provide new channels of release and partial inhibition of sensory stimuli, so that in due time a summation of these sensory stimuli will result more or less in normal action.

READING, Galveston, Texas.

MODIFICATIONS OF THE BABINSKI TOE SIGN IN A CASE OF CEREBRAL PALSY IN CHILDHOOD. S. M. WEINGROW, Arch. Pediat. **54**:502 (Aug.) 1937.

A case is reported.

ORR, Buffalo.

TWO CASES OF STREPTOCOCCIC MENINGITIS TREATED SUCCESSFULLY WITH SULFANILAMIDE AND PRONTOSIL. R. R. MELLON, M. H. WEINBERG and L. E. SHINN, J. A. M. A. **108**:1948 (June 5) 1937.

Two patients severely ill with streptococcic meningitis were treated successfully with sulfanilamide and a derivative of sulfanilamide (the sodium salt of 4-sulfamidophenyl-2′-azo-7′-acetylamino-1′-hydroxynaphthalene-3′,6′-disulfonic acid). One recovered, while the second still has partial paralysis of the third cranial nerve.

BONAR, Salt Lake City.

THE DANGERS AND TECHNIQUE OF SPINAL PUNCTURE. J. J. KEEGAN, Nebraska M. J. **2**:285 (Aug. 7) 1937.

The first requisite for a spinal puncture is a neurologic examination that shall be adequate. The general physician should be reasonably well qualified to make such an examination, even to the use of the ophthalmoscope. Without a competent ophthalmoscopic examination a spinal puncture should never be done in a patient suspected of having a tumor of the brain. If optic papilledema is present the spinal puncture should be done only with the greatest precaution to prevent fatal herniation of the cerebellum through change in intracranial pressure. The best position is that in which the patient is prone on the edge of the bed with his head and knees approximated. An irrational or noncooperative patient must be restrained or given a general anesthetic. The best insurance against breaking of the needle is to use a new rustless steel needle. Repeated painful prodding of the back has been responsible for discomfort in the back for many weeks. A local anesthetic may be used. The point of entry usually selected is at about the level of the crest of the ilium, and the local anesthetic need not go deeper than the skin. One should carefully seek an accurate estimation of the direction of the needle. Smaller needles are used than formerly. A 20 gage needle is large enough for routine use. The pressure of the spinal fluid should be estimated by a manometer. The fluid should not be withdrawn too rapidly, not faster than 1 drop per second. It should be subjected to a complete study. Cerebellar herniation into the foramen magnum is the most serious complication. The warning signals of this during puncture are a rather abrupt drop in the flow of the fluid and in the pressure, a complaint of pain in the back of the neck, difficulty in swallowing, cyanosis and cessation of respiration. The first symptom may not develop until a few hours later and may then progress slowly over several hours. When any of these symptoms develop, several things should be done at once: Stop the puncture, elevate the foot of the bed, give a hypodermic injection of caffeine and an intravenous injection of 500 cc. of 50 per cent sucrose, the latter to dehydrate the brain and thus reduce intracranial pressure. In a person with

a cerebellar tumor, all these measures are likely to fail and an emergency occipital trephining with tapping of a lateral ventricle or a suboccipital decompression may be necessary. Cisternal puncture cannot be recommended for routine application, but it has the advantage of avoiding postpuncture headaches.

HAMILTON, Omaha.

WERDNIG-HOFFMANN PARALYSIS IN THE ELDER OF TWINS. C. HARDWICK, Proc. Roy. Soc. Med. **30**:1071 (July) 1937.

It was noticed from birth that the child breathed rapidly with short, shallow respirations. At 7 weeks of age she could not move her arms, and her abdomen was distended. On admission to the hospital a few days later she moved neither arms nor legs, and the muscles of the thigh and upper arm were flabby and wasted. No reflexes were present. The other twin was examined and found normal.

WILLIAMSON, New Orleans.

POLYRADICULONEURITIS OF UNDETERMINED ORIGIN WITH ALBUMINO-CYTOLOGIC DISSOCIATION OF THE SPINAL FLUID. P. GIRAUD and J. BOUDOURESQUE, Arch. de méd. d. enf. **40**:505 (Aug.) 1937.

Two cases of the Guillain-Barre syndrome in girls of 3 years are reported, with an extensive review of the history, etiology and clinical features of the disease, known since 1906.

Most observers favor the theory that the syndrome takes its origin in an infection, such as tuberculosis. The viruses of poliomyelitis and encephalitis may also be concerned.

AMESSE, Denver.

A PARALYTIC FORM OF CEREBROSPINAL MENINGITIS. L. RIBADEAU-DUMAS and others, Nourrisson **25**:153 (May) 1937.

An 8 month old infant suffered from meningococcic meningitis, which was ushered in with fever and convulsions. The following day flaccid paraplegia appeared, and later, paralysis of the right arm. Serum treatment was unsuccessful.

The necropsy showed both diffuse encephalitis and foci of necrosis in the medulla.

MCCLELLAND, Cleveland.

Psychology and Psychiatry

THE PHYSICAL CONDITION OF READING DISABILITY CASES. T. H. EAMES, Arch. Pediat. **54**:489 (Aug.) 1937.

In most instances, improvement in reading is greatly accelerated when certain physical defects are removed or corrected. Among the conditions that contribute to disability in reading the most important are defects of the eyes, including subnormal vision, difficult vision, accommodation-convergence refractive errors, muscular imbalance and the like. Next in importance in the view of many is mixed cerebral dominance.

The findings in general physical and ocular examinations of 25 children with reading disability are summarized and compared with the findings in unselected school children.

ORR, Buffalo.

THE STUTTER-TYPE CHILD: SPEECH INDEX OF NEUROTIC BEHAVIOR. J. S. GREENE, J. A. M. A. **109**:187 (July 17) 1937.

Fifty per cent of the patients with speech disorders suffered from dysphemia (stuttering). A stuttering child is a nervously agitated organism demonstrating high emotional tone and excitation, with a tendency toward quick interruption or inhibition. Other types of hesitating performances may be present. The result is usually a state of anxiety and social maladjustment. Stuttering is considered

a physical symptom of psychic conflict. Since the child's difficulty is one of social adjustment, study of his case is directed toward integration and organization of his personality in order that he may become adjusted to home, school and social environment. The neuropathic diathesis is aggravated by parental tension and neuroticism and by lack of harmony in the preschool environment. The mother must be given an insight into child psychology and the importance of harmony in the home so that the child may be properly guided. In the handling of the child the pediatrician plays an important role, and by applying a few principles of mental hygiene he may effect the adjustments. BONAR, Salt Lake City.

CHILD GUIDANCE IN CALIFORNIA COMMUNITIES. N. FENTON and R. WALLACE, J. Juvenile Research **21**:125 (July) 1937.

This report, part 4 of the complete report of the California Bureau of Juvenile Research, is concerned with a statistical study of 1,660 children who had been referred to the bureau for investigation. The tables give a numerical picture of the various relationships that interest those concerned with clinics for the guidance of children. They show the sources of reference, the ages of the children referred, the relative frequency of each type of problem, the relation of sex and of the intelligence quotient to the type of problem, the placement in school and the relation of the type of problem to this placement, the economic status and finally the incidence of symptoms and problems, arranged in order of rank, among 795 children. Of course the classification of cases is necessarily rather indefinite. Each reader or each worker might have his own interpretation of every case. The list of problems (of personality, of behavior, of delinquency, of predelinquency, of mental deficiency and mental diseases, of difficulties in school, of miscellaneous sorts) suggests the indefiniteness of the types of problems.

HAMILL, Chicago.

HEREDITY AND CONSTITUTION IN THE AETIOLOGY OF PSYCHIC DISORDERS. E. KRETSCHMER, Brit. M. J. **2**:403 (Aug. 28) 1937.

Kretschmer concentrates in the beginning on the three main groups of mental diseases: the manic-depressive, the schizophrenic and the epileptic. He states that although one cannot always trace direct hereditary tendencies as regards the specific type of disease concerned, yet by studying the family tree one may find similar psychoses cropping up repeatedly. He feels that a psychosis is not inherited intermittently as an isolated special factor by itself but that a large condition conducive to the specific state is inherited.

Each of these hereditary diseases develops on the foundation of certain personalities in families of a definite coloration. "Thus each of these hereditary diseases is surrounded by a sphere of certain specifically characteristic hereditary constitutions and characters." They pass through a variety of manifestations which are not necessarily related to each other but which nevertheless on careful study are seen to be interrelated as to background. A number of the conditions, largely temperamental, which are termed cyclothymic are in reality pyknosomatic. The smaller groups also have their temperamental characteristics—for instance, the eunuchoid type.

Kretschmer then discusses the diagnosis of endogenous psychoses and analyzes the exogenous contributory factors. Both the discussion and the analysis are difficult to abstract. Then he considers the overlapping of hereditary and exogenous causes and discusses the exogenous psychoses. In his discussion of the influence of the constitution he makes the statement that the structure of the personality is in its essence constitutional and inherited. Hysterical conditions and manifestations are briefly outlined, with consideration of the conflicts with the outside world and the inability of the subject to cope with such difficulties.

This is one of the three lectures given at the Tavistock Clinic in April. It is not suitable for a definite abstract. ROYSTER, University, Va.

THE GAMES OF CHILDREN AND THEIR INFLUENCE ON HYGIENE. DELOBEL, Rev. méd.-sociale de l'enf. **5**:268 (July-Aug.) 1937.

Games are of great importance to children because they keep them mentally alert and favor physical development. Delobel expands on this theme and points out that in addition to these obvious benefits games stimulate the imagination and creative ability of the child and at once supply work and recreation. They develop body, mind and character. At this period of life many and rapid changes occur in the body, and games, according to Delobel, develop and maintain "physical equilibrium." These contentions are fortified by numerous quotations from the writings of the French psychologists and teachers. Kergomand succinctly states, "The game is the work of the child, his trade and his life." Méry and Genevriere say of play, "It is the first and most lasting form of personal activity."

Play is the principal occupation of childhood. [It is, if one excepts the trying round of academic and religious schooling, the music and dancing lessons and the part time work into which so many children are hurled. One must agree with the author, however, that play is natural exercise, with almost infinite developmental potentialities. Abstractor.] In games and play children are first brought into contact with others, and there they learn social conduct. A child soon learns that petty passions and selfishness exclude him from this social intercourse.

In considering the types of playthings for young children, Delobel points out that they must be unbreakable, large enough to preclude their insertion into any of the body orifices and have no loose small parts and no sharp corners or edges. The color too is of importance, for certain colors (green, yellow, red and white) are usually made from the pigments of heavy metals; vegetable colorings obviate this danger. Ideally, the toys should be boilable.

Games should always be adapted to the surroundings, and those for the youngest children should tend to teach them to use their hands and to recognize and name common objects. Briefly discussed are the different types of games providing mental and physical exercise for children of different age groups from the kindergarten period to the fifteenth year.

Passing over the quotation from Marion, "Physical perfection assures moral perfection," one comes to the closing sentence, "It (play) is a hygienic agent of the first order."

DIETRICH, Beverly Hills, Calif.

Diseases of the Genitourinary Tract

ACACIA THERAPY IN NEPHROTIC EDEMA. M. J. LEPORE, Ann. Int. Med. **11**:285 (Aug.) 1937.

Lepore believes that the intravenous use of acacia is effective not only in nephrotic edema but also in chronic active nephritis in the nephrotic stage. He recommends a 6 per cent solution of acacia in physiologic solution of sodium chloride. The aim of the therapy is to increase the volume of plasma, and it is contended that a 6 per cent solution given daily for from three to four days is as effective as a more concentrated solution.

Lepore states that the so-called deleterious effects described by other writers can be explained on grounds other than those of toxicity due to acacia.

Four cases are presented and graphs are shown illustrating the effect of acacia therapy on body weight, cell volume (in percentage), serum protein and serum volume.

READING, Galveston, Texas.

EFFECT OF BENZEDRINE SULFATE ON ENURESIS. M. MOLITCH and S. POLIAKOFF, Arch. Pediat. **54**:499 (Aug.) 1937.

Eight of twenty-two boys who were chronic bedwetters were relieved of their enuresis psychotherapeutically by means of placebos. Of the fourteen boys who failed to respond to placebos, twelve (86 per cent) were entirely relieved when

given increasing doses of benzedrine, terminating in from 5 to 25 mg. daily. All twenty-two reverted to bed-wetting within two weeks after this treatment was discontinued.

When on the placebos, the boys awakened themselves to urinate on an average of 0.73 time per night. On benzedrine, the average was 1.5 times per night. Twenty milligrams of this drug produced mild toxic effects

ORR, Buffalo.

TREATMENT OF PERSISTENT PYELITIS IN CHILDREN. H. F. HELMHOLZ, M. Clin. North America **21**:803 (May) 1937.

Acute pyelitis occurring in childhood is usually self-limited. Persistence of the infection is due as a rule to inadequate treatment or to obstruction in the urinary tract. When there is no obstruction, the acute condition almost always yields to adequate treatment, but in no case should the patient be dismissed without bacteriologic evidence of cure. When stasis is present and one kidney is found to be functionless, operation is indicated. If, however, from 15 to 30 per cent of function remains, an attempt should be made to reduce the infection to a minimum before attempting to restore normal drainage. The most useful means for combating urinary infection are ammonium mandelate, the ketogenic diet and methenamine, in the order named. The technic of treatment by these means is discussed.

EUGENE SMITH, Ogden, Utah.

THE SALT AND WATER METABOLISM OF NEPHRECTOMISED RABBITS: I. THE EFFECT OF THE INJECTION OF WATER OR GLUCOSE SOLUTIONS. W. J. O'CONNOR, Australian J. Exper. Biol. & M. Sc. **15**:97 (June) 1937.

Previous experiments on water and salt metabolism had suggested that there were extrarenal factors involved in the processes. The author therefore studied the question of sodium chloride-dextrose mobilization in nephrectomized rabbits. He concludes that: (1) after injection of sodium and chlorine these values tend to return to normal, whereas there is a persistent dilution of the solid content of the blood; (2) a nephrectomized animal is unable to regulate its volume of blood, but there is a storage of sodium and of chloride from which these ions can be obtained to restore normal ionic concentrations in extracellular fluids.

TENNEY, Madison, Wis.

THE SALT AND WATER METABOLISM OF NEPHRECTOMIZED RABBITS: II. THE EFFECT OF THE INJECTION OF WATER OR GLUCOSE SOLUTIONS. W. J. O'CONNOR, Australian J. Exper. Biol. & M. Sc. **15**:205 (Sept.) 1937.

The studies on salt and water metabolism were continued, and the author concludes:

1. ". . . plasma sodium returns toward normal during the two hours following the injection. This change is prevented if chloride without bicarbonate is injected. No similar changes occur in the plasma chloride"

2. ". . . the nephrectomized animal is able to remove sodium to some depot area."

TENNEY, Madison, Wis.

p-AMINOBENZENESULPHONAMIDE IN TREATMENT OF BACTERIUM COLI INFECTIONS OF THE URINARY TRACT WITH A NOTE ON THE TWO-PLATE BACTERIAL COUNT. M. KENNY, F. D. JOHNSTON and T. VON HAEBLER, Lancet **2**:119 (July 17) 1937.

The authors found that small doses of sulfanilamide (para-aminobenzenesulfonamide) effected rapid disappearance of Bacterium coli and pus cells from the urine and remission of symptoms in forty-six women with symptoms pointing to disease of the urinary tract. The urine showed bactericidal power roughly proportional

to its sulfanilamide content. Strains of Bact. coli are not all equally susceptible to this bactericidal action, some being almost completely resistant.

LANGMANN, New York.

HYPOSPADIAS: ITS EFFECTS, SYMPTOMS AND TREATMENT. A. R. THOMPSON, Lancet **2**:429 (Aug. 21) 1937.

This study is based on 101 cases. It lists the types of hypospadias according to the position of the opening, viz., concealed, glandular, coronal, postcoronal, corporeal, penoscrotal, scrotal and perineal.

In Thompson's hands plastic operations designed for relief of minor degrees of the condition have not led to the success anticipated from the good results experienced in similar operations for the major varieties.

LANGMANN, New York.

EPISODE IN HISTORY OF GYNANDROID HERMAPHRODITE. L. OMBRÉDANNE, Bull. Soc. de pédiat. de Paris **34**:87 (Feb.) 1936.

An adolescent child with a male type of body and penis and an underdeveloped scrotum but with uterus and ovaries had been operated on in an attempt to correct hypospadias. A menstrual flow appeared from the urethra. Exploration of the perineum revealed no vaginal orifice. It was decided to allow the child to continue as a boy and to do a hysterectomy and oophorectomy if menstruation became troublesome.

BENJAMIN, Montreal, Canada.

CASE OF RENAL GLYCOSURIA: DEATH OF UREMIA. P. ROHMER, Bull. Soc. de pédiat. de Paris **34**:463 (July) 1936.

A poorly nourished boy 2 years old had glycosuria without hyperglycemia and showed albumin and casts in the urine. He was observed for only a short time, but he was thought to have chronic nephritis. Tests of renal function were not done. About a year after he came under observation he died of uremia.

BENJAMIN, Montreal, Canada.

Diseases of the Ductless Glands; Endocrinology

FUNDAMENTAL FACTS OF THE PROPHYLAXIS IN DIABETIC MELLITUS. E. LYON, Am. J. Digest. Dis. & Nutrition **4**:380 (Aug.) 1937.

In this article Lyon expresses the belief of Joslin that diabetes mellitus is a disease which may be prevented or at any rate greatly lessened as to incidence. He believes that although heredity undoubtedly plays a strong part, obesity and the sedentary living of the present generation account for any increase in the incidence of diabetes mellitus. It is brought out that the incidence of diabetes mellitus decreased in Germany during the war, when the amount of food available was lessened and the generation concerned led a more active life.

The marriage of members of obese and obese-diabetic families should be discouraged.

MORRISON, Savannah, Ga.

FURTHER EXPERIENCE IN THE DIAGNOSIS OF HYPERPARATHYROIDISM INCLUDING A DISCUSSION OF CASES WITH A MINIMAL DEGREE OF HYPERPARATHYROIDISM. F. ALBRIGHT, H. W. SULKOWITCH and E. BLOOMBERG, Am. J. M. Sc. **193**:800 (June) 1937.

This paper is based on thirty-five cases in which hyperparathyroidism was demonstrated by operation. It represents a ten year experience. The series comprises thirteen cases in which the disease had been suspected and twenty-two cases in which it had been diagnosed. In all but two of the twenty-two cases the clinical

findings were entirely different from those reported in the literature. There were two groups of cases in particular which have accounted for multiple cases which are not being recognized. These were: (*a*) cases in which there was no demonstrable bone disease—12; (*b*) cases in which the hyperparathyroidism was moderate —8. The presence or absence of bone disease is not a function of the degree of hyperparathyroidism, some of the patients with severe hyperparathyroidism not having it, and some of the ones with mild hyperparathyroidism having it. Patients with bone disease and high levels of serum phosphatase as a rule show postoperative hypocalcemia; other patients seldom do. The term "borderline" has been applied to mild hyperparathyroidism and refers to the degree of hyperparathyroidism, not to the symptoms. In the diagnosis of a borderline condition the following points may be important: (*a*) the level of the serum protein, as allowance can be made for the bound calcium in interpreting the total calcium value; (b) a persistently low level of serum phosphorus; (*c*) the amount of calcium excreted in the urine; (*d*) the composition of the stone, and (*e*) the values of calcium found in repeated determinations.

HENCKE, Omaha.

ON THE SPECIFICITY OF THE THYROTROPIC ACTION OF THE ANTERIOR PITUITARY GLAND. K. EMERSON JR., Bull. Johns Hopkins Hosp. **60**:358 (May) 1937.

Extracts of beef ovary, purified by Loeser's method, produce no changes in the thyroid gland of the guinea-pig, whereas similar extracts of the anterior lobe of the beef pituitary cause good stimulation of the thyroid. The same holds true for the crude acetone-desiccated powders made from these two glands.

Guinea-pig anterior pituitary powder produces definite stimulation in the guinea-pig thyroid if given in sufficiently large amounts or over a long enough period. The absolute concentration of thyrotropic substance is definitely less in guinea-pig than in beef anterior pituitary.

FROM THE AUTHOR'S SUMMARY.

THE EFFECT OF ADRENALECTOMY AND THYROIDECTOMY ON KETONURIA AND LIVER FAT CONTENT OF THE ALBINO RAT FOLLOWING INJECTIONS OF ANTERIOR PITUITARY EXTRACT. EDITH G. FRY, Endocrinology **21**:283 (March) 1937.

It has been demonstrated that injections of anterior pituitary extracts produce marked acetonuria in rats maintained on high fat diets.

Adrenalectomy completely suppressed this acetonuria, while the presence of adrenal cortical tissue permitted the ketogenic response. Neither therapy with adrenal cortical extract nor thyroidectomy replaced the action of cortical tissue.

JACOBSEN, Buffalo.

LAURENCE-MOON-BIEDL SYNDROME. J. B. GILLESPIE, Illinois M. J. **71**:429 (May) 1937.

Gillespie reports a case and reviews the literature.

BARBOUR, Peoria, Ill.

CLINICAL RESULTS OF ANTERIOR PITUITARY THERAPY IN CHILDREN. A. W. JACOBSEN and A. J. CRAMER JR., J. A. M. A. **109**:101 (July 10) 1937.

Because of the great discrepancy between the results of laboratory study of the action of anterior pituitary substances in animals and the results of clinical application of these substances, there exists widespread skepticism among conservative clinicians as to their value. Jacobsen and Cramer report on ten children who were treated with an extract of the anterior lobe of the pituitary. These children were selected to show what results may be obtained in dwarfism, infantilism, hypogonadism and certain types of obesity. Desiccated thyroid used in conjunction with an extract of the anterior lobe of the pituitary usually produces more rapid improvement than the latter does when it is given alone.

BONAR, Salt Lake City.

PRIMARY HYPERPLASIA OF THE THYROID IN ONE OF STILLBORN TWINS. S. WARREN and L. B. SHPINER, J. A. M. A. **109**:575 (Aug. 21) 1937.

Primary hyperplasia in one of stillborn twins, probably identical, has not been reported before. A quadripara three months pregnant had a marked enlargement of the thyroid with symptoms of hyperthyroidism. The goiter was removed in two stages, and three days after the last operation she aborted. The second twin had the umbilical cord twisted about one of its arms, and there was edema of this member. The thyroid was markedly enlarged. The twins were almost certainly identical. Since it is thought that hereditary influence conditions goiter and since it affects identical twins to the same degree, the presence of goiter in one twin and not in the other is thought due to mechanical factors, that is, to compression by the cord. The authors believe that the goiter present in both receded after operation in one twin but did not in the other because of obstruction to the umbilical cord.

BONAR, Salt Lake City.

DISEASE OF THE THYROID GLAND IN CHILDREN. R. L. J. KENNEDY, M. Clin. North America **21**:827 (May) 1937.

This valuable paper, especially the sections on exophthalmic goiter and hypothyroidism, should be consulted in the original by those interested in thyroid conditions in childhood. A summary would not do the paper justice.

EUGENE SMITH, Ogden, Utah.

TOTAL THYROIDECTOMY FOR HUMAN DIABETES INSIPIDUS. T. FINDLEY and P. HEINBECKER, Proc. Soc. Exper. Biol. & Med. **36**:448 (May) 1937.

A total thyroidectomy in a 55 year old colored man with clinical diabetes insipidus diminished the diuretic effect of sodium chloride and increased the antidiuretic effect of pitressin (beta hypophamine). The patient insisted that his thirst and polyuria were less distressing after the operative procedure. It did not reduce the flow of urine below the limits set by a low salt diet.

HANSEN, Minneapolis.

AN EXTRACT FROM THE ADRENAL GLAND CAUSING LUTEINISATION OF THE OVARIES AND ENDOMETRIAL HYPERPLASIA. R. ALLEN and G. BOURNE, Australian J. Exper. Biol. & M. Sc. **14**:45 (March) 1936.

Allen and Bourne describe a stable aqueous extract of adrenal glands which is capable of causing luteinization of the ovaries and endometrial hyperplasia when injected into immature female rats. The active principle appears to be distinct from that of extract of adrenal cortex.

GONCE, Madison, Wis.

THE EFFECTS OF STIMULATION OF THE ADRENAL GLAND UPON ITS CONTENT OF ASCORBIC ACID, ADRENALIN AND GLUTATHIONE. C. C. KUCHEL and M. L. MITCHELL, Australian J. Exper. Biol. & M. Sc. **14**:51 (March) 1936.

Kuchel and Mitchell, working with rats, observed that (1) light anesthesia due to ether and other conditions involving stimulation of the adrenal glands cause a fall in the average amount of cevitamic acid of these glands; (2) the fall in the cevitamic acid content bears no constant relation to the simultaneous fall in the epinephrine content; (3) the ratio of glutathione to cevitamic acid in the whole gland shows no marked variation as a result of stimulation.

GONCE, Madison, Wis.

DIABETES AND TUBERCULOSIS. D. M. DUNLOP, Edinburgh M. J. **44**:351 (May) 1937.

Diabetes does not develop frequently in tuberculosis, but the reverse frequently occurs. Early tuberculosis is seldom recognized in diabetes; for patients are apt

to lose weight and become exhausted as a feature of the known diabetes. But hemoptysis, definite fever and a cough with abundant sputum are symptoms to bring out the real diagnosis.

When a previously controlled diabetic patient needs for no visible reason bigger doses of insulin, loses weight and fails in health, the complication of tuberculosis should be suspected. Such an outcome is found in patients, especially children, who have had diabetic coma. Frequent examinations for tuberculosis should be made in young diabetic patients, who should never be allowed to be near persons with open tuberculosis.

Early diagnosis of tuberculosis and careful treatment of the diabetic patient prevent diabetes from unfavorably affecting tuberculosis.

NEFF, Kansas City, Mo.

THE TREATMENT OF DIABETES — CLINICAL AND EXPERIMENTAL OBSERVATIONS WITH NEW INSULINS. I. BENNETT, T. M. DAVIE, D. GAIRDNER and A. M. GILL, Lancet **1**:1319 (June 5) 1937.

The authors conclude that it is unwise, in the present state of knowledge, to substitute one of the new insulins for ordinary insulin unless there is a valid objection to multiple doses or a tendency toward frequent hypoglycemic attacks owing to the too rapid effect of ordinary insulin. At the present time, if it is desirable to employ one of the slower insulins, protamine insulin is probably the safest preparation available.

LANGMANN, New York.

SOME ASPECTS OF PEDIATRIC ENDOCRINOLOGY. L. DODDS, M. J. Australia **2**:255 (Aug. 14) 1937.

Dodds reviews some of the endocrine dysfunctions and makes a plea for recognition of mild degrees of thyroid deficiency. He mentions the problems in the treatment of vaginitis with estrogenic substances, particularly those of dosage and duration of treatment.

TENNEY, Madison, Wis.

A PHARMACOLOGIC STUDY ON GALACTOGENIC PLACENTAL EXTRACTS. E. MESSERI, Riv. di clin. pediat. **35**:503 (June) 1937.

Tests of the galactogenic action of placental extracts were made on virgin guinea-pigs. The active principle was found in the protein residue of the extract, and not in the lipoid fraction.

HIGGINS, Boston.

TREATMENT OF DIABETES IN CHILDREN WITHOUT RESTRICTION OF DIET. C. E. RÄIHÄ, Acta pædiat. **19**:433, 1937.

Judged by the results of Forsell's inquiry into the fate of 162 diabetic children treated in the University Children's Clinic, Helsingfors, between the years 1922 and 1933, the prognosis for juvenile diabetes in Finland is exceedingly poor: 63.4 per cent of the patients had died at the time of the check-up. The high mortality is probably ascribable to lack of close medical supervision of the diabetic children; this in turn is related to the fact that the country is sparsely populated.

After the example of Stolte and others in Germany and of Söderling in Sweden, and in the face of numerous protests from authorities on diabetes, in the fall of 1934, at the University Children's Clinic the policy was inaugurated of treating all diabetic children without restriction of diet. The following precepts served to guide the experiment: 1. The general condition of the patient had to remain satisfactory. 2. No quantitative or qualitative restrictions of diet were to be imposed, except that gluttony and the gross abuse of sweets were forbidden. 3. Insulin was to be employed in doses sufficient to prevent the occurrence of acidosis and to keep the fasting blood sugar in the morning at or below 500 mg. per hundred cubic centimeters. The aim was to get along on two injections a day; these were

usually given in the morning and evening at the beginning of the meal. 4. The children were to be allowed full physical activity while being transferred from the measured diet to the free diet in order to simulate as closely as possible the conditions under which they would live at home. 5. At the time of discharge from the hospital the children were to be advised always to carry a piece of sugar, to be eaten on the slightest premonition of impending hypoglycemia. For psychologic reasons the children were trained to make their own injections whenever possible.

At the time of the report 44 patients were under treatment; of these, 20 had been treated for from six months to two years according to the old plan. Although the new plan was instituted with considerable apprehension, the results have been highly gratifying. The number of patients who have required hospital treatment because of coma or precomatous conditions has decreased significantly. Of the 20 patients who had been treated according to the old scheme, some have required more insulin with the new method; some, less. Of this group, only 1 patient has died, although Forsell's figures would have given reason to predict several fatalities. Under the new régime the fasting blood sugar in the morning is usually above 250 mg. per hundred cubic centimeters and frequently much higher, although it seldom exceeds 450 mg. The twenty-four hour excretion of sugar in the urine is also high, averaging 100 Gm. and occasionally reaching 250 Gm. The urinary volume is correspondingly increased, in some cases reaching 3,000 cc. daily, although ordinarily not exceeding 1,500 cc. The concentration of sugar in the urine varies between 5 and 9 per cent. Acetone seldom appears in the urine, although rarely a trace may be demonstrated. The patients who have come under treatment most recently require less insulin than those who were treated in the beginning of the experiment. This is probably due to increasing confidence in the method and diminishing eagerness to control the level of the blood sugar and the excretion of dextrose in the urine.

On the basis of brief observation, the total mortality for the group of 44 patients is computed to be 15.9 per cent. Half of the patients have been treated for about one year, one-quarter less than one year and one-quarter more than one year. In Forsell's series about 60 per cent of the patients died within the first year of treatment. Of the deaths the majority have been due directly or indirectly to hypoglycemia; this complication seems to constitute the greatest danger of the free diet. It is a peculiar jeopardy in the case of infants and young children.

The nutritional progress of the patients has been exceptionally satisfactory; the same is true of their growth in length. One of the patients has reached puberty, namely, a 13 year old girl, whose menarche was attained in normal fashion. The children appear to withstand infection without undue difficulty. In all cases the mental attitude of the patients treated without restriction of diet in comparison with the harassed frame of mind of those burdened with strict regulation constitutes one of the most cogent arguments in favor of the new plan of treatment. Parents often express gratification with this feature.

The theoretical arguments in favor of the method are at least as forcible as those against it; both sets of premises are insecurely grounded and should not be allowed to stand in the way of the widespread clinical evaluation of the *freie Kost*.

McCune, New York.

A Clinical Contribution Relating to Hypoglycemia in Children. N. Malmberg and F. Wahlgren, Acta pædiat. **19**:457, 1937.

An emotionally unstable 6 year old girl had been born prematurely and remained somewhat retarded in her physical development. Convulsions set in when she was 1 year old and recurred infrequently and irregularly up to the time of her death at 6 years. They were apt to occur in the morning before breakfast; at such times they were accompanied by vomiting. The convulsions were sometimes precipitated by fever, but on many occasions occurred without apparent cause. Tetany and epilepsy were first suspected; the child was almost 6 years

of age when chemical studies established indisputably the hypoglycemic origin of the convulsions. After a twelve hour fast the blood sugar was frequently found to be between 40 and 60 mg. per hundred cubic centimeters, sometimes lower; after longer periods of starvation the concentration could be brought to below 20 mg. and convulsions produced. The duration of the normal rise of blood sugar following the ingestion of dextrose was curtailed; the subsequent decline usually reached lower levels than normal. Tests with galactose and with epinephrine yielded normal results. The patient died of peritonitis. Autopsy revealed hyperplasia of the islands of Langerhans and hypoplasia of the adrenal glands. Although the pituitary gland was small, it exhibited microscopically no pathologic alterations. The liver, ovaries, pineal gland, thymus and thyroid were normal.

McCune, New York.

Determinations of Blood Cholesterol as an Auxiliary Means of Diagnosing Myxedema in Children. S. Gørtz, Acta pædiat. **19**:553, 1937.

Gørtz confirms the findings of numerous investigators to the effect that in myxedema and cretinism the cholesterol of the whole blood is increased well above normal. In analyses of 67 samples of blood from 36 healthy children varying in age from birth to 12 years he found that the concentration of cholesterol was between 108 and 166 mg. per hundred cubic centimeters of the whole blood; in analyses of 208 samples of blood from 107 sick children he observed up to 200 mg. of cholesterol per hundred cubic centimeters; in 8 determinations in 8 cases of unquestionable cretinism the lowest value was 249 mg. and the highest 307 mg. He emphasizes a fact which is now almost generally recognized, namely, that determinations of cholesterol made with serum or plasma are to be preferred to measurements made with whole blood. Knowledge of the concentration of cholesterol in the blood provides important diagnostic aid as regards cretinism; naturally, thyroid treatment must be discontinued for about a month before the test is made. The concentration of cholesterol is not increased in the blood of children whose obesity is not due to or associated with hypothyroidism. There is a brief bibliography.

McCune, New York.

Skin Diseases; Allergy

Von Recklinghausen's Neurofibromatosis in Children. I. C. Le Bell, Arch. Pediat. **54**:454 (Aug.) 1937.

Three cases are presented. One child demonstrated tumors and pigmentation; another, pigmentation, speech difficulties and ptosis of the eyelids; the third, pigmentation and a bony abnormality with the morphologic character of osteitis fibrosa cystica. Two of the children had what the author describes as a foolish expression on their faces.

Recklinghausen's disease is a syndrome. The primary signs are small tumors of the cutaneous or deeper nerves and characteristic pigmentation. The secondary manifestations are the familial congenital and hereditary traits, some endocrine dyscrasis, bony abnormalities, malignant transformations and mental disturbances.

Orr, Buffalo.

Erythrodermia Desquamative (Leiner's Disease). H. E. Thelander, Arch. Pediat. **54**:496 (Aug.) 1937.

A case is reported.

Orr, Buffalo.

Vitamin F Ointments. M. L. Weinstein and K Glennon, Illinois M. J. **71**: 477 (June) 1937.

The authors discuss lack of vitamin F as a possible etiologic factor in eczemas and advocate its use in the treatment of these disorders.

Barbour, Peoria, Ill.

DYSCHROMIA OF THE FACE, WITH A REPORT OF THREE CASES. E. ROSANOVE, M. J. Australia **2**:348 (Aug. 28) 1937.

Rosanove classifies the dyschromias of the face into five main groups: (1) pigmentation due to physical and chemical causes; (2) Riehl's melanosis, which includes Civatte's reticulated pigmentary poikilodermia, and tar melanosis, or the melanosis of Hoffmann and Habermann; (3) chloasma; (4) vitiligo; (5) érythrose péribuccale pigmentaire de Brocq. The histories of three cases are presented, one belonging to group 5 and two to group 3. The origin of the pigment formation and the possible pathogenesis are described. GONCE, Madison, Wis.

OBSERVATIONS ON SKIN SENSITIVITY IN ASTHMATIC AND CONTROL SUBJECTS. R. S. BRUCE PEARSON, Quart. J. Med. **6**:165 (April) 1937.

A comparative study of the cutaneous sensitivity of asthmatic persons and of normal controls was made. As a result of overlapping in the intensity of the reactions in the two groups, the author concludes that the value of cutaneous tests as a clinical procedure must be diminished and that no special importance can be attached to the presence of cutaneous sensitivity in individual cases unless its significance can be established on other grounds. As one might expect, the percentage of positive reactions and the proportion of large reactions were considerably greater among the asthmatic subjects, but positive reactions occurred with considerable frequency among the controls.

The review suggests that it would be significant if clinical asthma should later develop in some of the reacting controls. BRADFORD, Rochester, N. Y.

PRIMARY TUBERCULOUS LESION OF CHEEK OF LUPOID APPEARANCE. L. RIBADEAU-DUMAS and LE MELLETIER, Bull. Soc. de pédiat. de Paris **34**:83 (Feb.) 1936.

A girl 2½ years old had a lesion on the left cheek, which had first appeared as a tiny nodule a year before examination, and swelling of the left submaxillary glands. Cheesy material aspirated from a gland contained numerous tubercle bacilli. After six months the lesion on the face showed cicatrization, but there were some lupus-like nodules about the scar tissue. The tuberculin reaction was positive. A roentgenogram of the chest showed no abnormality. Phlyctenular conjunctivitis developed shortly after the patient's admission to the hospital. The authors believe she had a primary tuberculous lesion of the skin, although lupus is usually considered to be due to a local endogenous or exogenous reinfection in an allergic person. BENJAMIN, Montreal, Canada.

RETICULOSARCOMA IN GIRL EIGHTEEN MONTHS OLD. P. NOBÉCOURT and R. LIÈGE, Bull. Soc. de pédiat. de Paris **34**:91 (Feb.) 1936.

A girl 18 months old had tumors of the scalp, which first appeared three months before examination. Biopsy revealed malignant neoplastic tissue which resembled reticulosarcoma. Despite her good general condition, the prognosis was grave. BENJAMIN, Montreal, Canada.

ACUTE MILIARY TUBERCULOSIS OF SKIN IN NURSLING. ALEXANDER KUX, Bratisl. lekár. listy **16**:29 (Jan.) 1936.

A review of the literature reveals only a few cases of disseminated tuberculid. A girl of 6 months had had a cough for two weeks and a rash for four weeks. One sibling was well, but a 14 year old paternal cousin and the father had died of tuberculosis. The Pirquet test gave a strongly positive result, and a roentgenogram of the chest revealed miliary dissemination in both lungs. The lesions were distributed generally but were more abundant in the diaper area. They consisted of a central purulent bleb on an indurated red to hemorrhagic elevation varying up to over a centimeter in diameter. When the bleb was evacuated, an ulcerating crater resulted. Some blebs simulated varicella. No organisms of

tuberculosis were observed when the lesions were studied histologically post mortem. The author classifies the cutaneous manifestation as an exanthemic tuberculid, in contradistinction to localized tuberculids, such as lupus vulgaris and tuberculosis verrucosa cutis. STULIK, Chicago.

ON COLLOIDAL INSTABILITY OF THE RABBIT SERUM IN ACTIVE ANAPHYLAXIS. T. OKAMOTO, Orient. J. Dis. Infants **21**:247 (March) 1937.

Matefy's and Daranyi's reaction of the serum of a rabbit during the period of incubation of active anaphylaxis induced by the injection of normal horse serum gradually became increasingly positive, the highest degree being reached from seven to ten days after the injection. After a second injection of the same serum the reaction may suddenly become positive or negative. KATO, Chicago.

SEDIMENTATION RATE OF THE RED BLOOD CORPUSCLES IN THE RABBIT SUFFERING FROM ACTIVE ANAPHYLAXIS. T. OKAMOTO, Orient. J. Dis. Infants **21**:267 (March) 1937.

In rabbits sensitized to horse serum the sedimentation rate of the erythrocytes increases during the period of incubation, reaching its peak in from seven to thirteen days. A second inoculation of the allergen, however, decreases the rate to almost normal. KATO, Chicago.

Miscellaneous

PHYSICAL THERAPY IN PEDIATRICS. L. F. BENDER, Arch. Pediat. **54**:449 (Aug.) 1937.

Bender describes various physical therapeutic agents used in the practice of pediatrics. ORR, Buffalo.

PIRQUET CUBICLES FOR INFANTS. B. SCHICK and S. KARELITZ, J. A. M. A. **108**: 1684 (May 15) 1937.

The authors relate their experiences with the Pirquet type of glass cubicles for infants. They found them suitable for use not only in wards for infants in general but especially in wards for new-born infants. The Pirquet isolation unit is a satisfactory and economical step forward in the solution of the problem of preventing the transmission of infectious diseases. BONAR, Salt Lake City.

DIAGNOSIS OF ABDOMINAL ENLARGEMENTS IN CHILDREN. S. AMBERG, M. Clin. North America **21**:813 (May) 1937.

This paper is essentially a catalog of all possible forms of abdominal enlargements occurring in children, with brief comments on diagnosis. It will especially help the puzzled practitioner who is confronted with a diagnostic problem in this region. EUGENE SMITH, Ogden, Utah.

VENOUS PUNCTURE IN THE CHILD. E. PELUFFO and C. E. CASTELLS, J. de pediat., Rio de Janeiro **4**:355 (Aug.) 1937.

Puncture of the internal jugular vein is described. SANFORD, Chicago.

THE FIXATION OF POTASSIUM INJECTED INTO THE BLOOD STREAM. BERNARDO A. HOUSSAY and AUGUSTIN D. MARENZI, Rev. Soc. argent. de biol. **13**:139 (July) 1937.

The authors conclude from experiments conducted on dogs which had been anesthetized by intravenous administration of chloral hydrate that:

1. The maximum dose of potassium chloride injected intravenously that can be tolerated by a dog is 20 mg. per kilogram of weight.

2. Potassium chloride injected intravenously disappears rapidly from the blood. Since nephrectomy, hepatectomy and extirpation of the entire gastrointestinal tube do not alter the curve of disappearance, potassium is fixed principally in the muscles.

3. Dogs tolerate well an injection of 20 mg. of potassium chloride per kilogram per minute for an hour.

4. The continuous injection of 20 mg. per kilogram per minute during one hour provokes an increase of potassium in the plasma, the liver and the muscles.

5. The content of potassium in the different muscles varies considerably, even in symmetric muscles. It varies, too, in different portions of the same muscle.

6. The erythrocytes do not fix the potassium appreciably in the general circulation.

KALISKI, San Antonio, Texas.

CHRONIC ABDOMINAL SYNDROMES IN CHILDREN. I. REYDERMANN and A. GUERSTEIN, Acta pædiat. **19**:567, 1937.

Because of his extensive experience with infants the pediatrician is apt to exhibit a somewhat naive point of view toward the gastro-intestinal disorders of older children. Duodenal ulcer and angiocholecystitis are far from rare in children, although they are seldom suspected clinically and are usually demonstrated as accidental observations at operation or autopsy. If the pediatrician will employ more consistently the well established diagnostic methods of gastro-enterology as applied to adults, he will come to recognize with increasing frequency many of those lesions of the stomach and intestines which have hitherto been thought to occur commonly only in older persons.

MCCUNE, New York.

ALCOHOL AND NICOTINE INTOXICATION IN BABIES. C. J. W. BISDOM, Maandschr. v. kindergeneesk. **6**:332 (May) 1937.

Two cases are described. In one alcohol intoxication was discovered in a breast-fed baby 8 days old whose mother had drunk a whole flask of port wine within a short time; alcohol could be demonstrated in the blood of both mother and child. In the second case nicotine intoxication with all the characteristic symptoms was observed in a breast-fed baby of 6 weeks whose mother was daily smoking at least twenty cigarets. After omission of the maternal milk, which contained nicotine, serious symptoms of abstinence occurred. After symptomatic treatment both children recovered.

VAN CREVELD, Amsterdam, Netherlands.

Society Transactions

CHICAGO PEDIATRIC SOCIETY

C. A. ALDRICH, M.D., *President*

Regular Meeting, Jan. 18, 1938

GEORGE F. MUNNS, M.D., *Secretary*

THE ORGANIC THEORY OF MIND AND ITS BEARING ON EDUCATION. ERNEST O. MELBY (by invitation).

I sometimes feel that the period of life during which the pediatrician has influence over the child should be extended. The pediatrician is educated in knowledge of the whole child, whereas the teacher has a limited knowledge of the child and a wide knowledge of the subject to be taught. It is more important to know the type of man who has a disease than to know the type of disease he has.

Educators have devised some fearful and wonderful tests to be applied to all children, dividing them arbitrarily into three groups. At the top is the group of "almost geniuses"—the children from whom all that is hoped for in the world must come. The middle group is made up of the great mass of humanity. It is said that if this group were trained properly and subjected to the right kind of education, they would not do too much harm, but one could not hope for much from this group. At the bottom is an utterly hopeless group for whom little can be done. This is probably one of the most diabolic conceptions of the human race ever devised. It is sinful and it is not true. Physicians know that it is not true and have never been led into such a misconception. To them the most benighted members of the human race are worth saving.

Mr. Washburne has said that every human being is different and further that this is an advantage, not a disadvantage. Every member of this assembly tonight is unique—there never has been, there never will be a man just like him. He has the possibility of being something that never before has been and never will be again. Educationally, what can be done to make the most of the child's possibilities, his capacity for uniqueness? If a group of people were asked to paint the same object, the finished paintings would all be different and each would have in it some element distinctly creative. Probably the most dynamic factor that could be injected into medical practice, into social life or into politics would be one by which not only those persons who have an intelligence quotient of 100 or more but all persons would be considered to possess creative faculties.

The pediatrician is more likely to be sympathetic with the child in his problems of growth and development than the teacher, who is interested in the subject to be taught rather than in the pupil. If the possibilities of each person are to be developed, each child should be regarded as a future Shakespeare or Mendelsohn.

THE LIVING PHILOSOPHY OF EDUCATION. CARLETON WASHBURNE, Superintendent of Public Schools, Winnetka, Ill. (by invitation).

The purposes of education should be: (1) to give children a thorough grounding in the useful parts of the common school subjects, such as reading, writing, arithmetic, spelling, history, geography and science; (2) to train them for wise, patriotic and responsible citizenship; (3) to develop each child's individuality, his special interests and abilities, and (4) to help each toward a balanced, happy and well adjusted emotional life, on which alone sound character can be built.

In the average school about 1 child in every 4 fails from one to four times on his way from the first to the eighth grade. The factors contributing to this may be

summarized as follows: Children differ widely in their ability to learn school subjects, and they mature intellectually at different rates. For learning any given thing there is a definite time of readiness, and many school failures are due to forcing the bud. Interest is essential for effort. This psychologic law is often misunderstood—it does not mean that children should be allowed to do as they please or that the work should be "sugar coated." It means that a child must see the value of what he is doing if he is to exert sincere effort. The entire course of study must be planned and continuously revised in terms of present and future use.

Citizenship requires more than a formal study of civics and of history. It requires a habit of social thinking—of thinking in terms of the well-being of the community, the nation and all mankind. This must be developed through social living—through cooperative work and play. Through an organized and supervised playground program children learn the value of teamwork and acquire such virtues as good sportsmanship and endurance. In the democratic organization of the school they learn to practice citizenship as a matter of daily living. In group enterprises they learn cooperation and social expression.

There would be no progress if individuals did not differ from the mass. To check originality of thought and action is deadening. To help a child discover his special interests and abilities will help him, as he grows up, to choose the kind of work that he can do best, the kind that will make him happiest. To develop his tastes, interests and talents will help him to make wise use of his leisure. Leisure can be his undoing or it can be a blessing, according to the way he uses it. Education must include training for its wholesome use.

To an onlooker a child making a boat, painting a picture, writing or editing a school magazine or acting a role in a drama may seem to be just playing. These activities, however, are profoundly educational. They draw out the child's talents. They stimulate him to thought and action. They call forth initiative.

To help each child toward a balanced, happy and well adjusted emotional life is one of the basic purposes of education. On such a life sound character may be built. If this aim fails, all others are valueless. In the study of unsatisfactory behavior, the search for causes may disclose physical defects, in which case a physician may be needed. The causes may lie partly in the home environment—jealousy, conflicting home discipline. There may be unwise handling by a teacher or school work that is unsuitable or poorly understood. Whatever the causes may be, they must be found before a remedy can be applied. In this, parental cooperation is essential. School and home must work in complete harmony and understanding, with mutual respect and sympathy.

Each year sees further progress in education. Methods which are producing these improvements will not be lightly discarded. But the defects of these methods should be and are being carefully studied. Methods are continuously under critical examination. They are always being revised and improved. They are not the fundamental part of the schools. They are merely ways of working toward the four goals.

NEUROLINGUISTIC FACTORS IN CHILD DEVELOPMENT. G. D. G. CAMPBELL (by invitation).

Human biology differs from animal biology chiefly because of the form and functions of the human nervous system, which, through cortically controlled powers of symbolization, has created an environment in which symbols and the evaluations, adaptive experiences, orientations, etc., which they represent accumulate throughout successive generations of human beings. The principal form of symbolization is linguistic. One may speak therefore of neurolinguistic and neurosemantic (evaluational) factors in human development. The nervous system of the child is not completely developed at birth, structurally or functionally, so that only with maturation can the human being appraise properly the meanings, doctrines and other evaluations implicit in the language systems which constitute

his neural environment. As ordinary language is archaic in origin, has been sanctioned by usage and tradition and is codified by "logic," it necessarily communicates to incoming generations of man adaptive experiences of the race which are out of date and often inappropriate to contemporary problems of adaptation. The child's nervous system cannot properly evaluate many ideas of highly abstract type, implicit or explicit in the language it sees or hears, and frequently it confuses ideational levels with experiential levels, notions with happenings, words it hears with its own thoughts or images and so on—a process described as identification. The emotive and sensory characteristics of ordinary language may also overstimulate thalamic levels of neural activity with consequent establishment of the dominance of emotional (immature) over rational (mature) evaluation.

These and other dangers are discussed, with emphasis on the neural mechanisms involved and the need for broader principles of hygiene, which would include neurolinguistic and neurosemantic factors of development.

CHICAGO PEDIATRIC SOCIETY AND CHICAGO ORTHOPAEDIC SOCIETY

C. A. Aldrich, M.D., *President*

Joint Meeting, Feb. 11, 1938

George F. Munns, M.D., *Secretary*

Care and Treatment of Cerebral Spastic Paralysis. Dr. Winthrop Morgan Phelps, Baltimore (by invitation).

This is a rather general problem in which the orthopedic demands are the greatest single factor, but orthopedic measures alone will not always accomplish the desired results. In most instances of cerebral spastic paralysis there is a deviation from normal which has existed since birth and this fact differentiates the condition from acquired conditions. The relationship of the motor defects to the total picture of the patient as an intelligent person is the problem. In a child so affected the absence of certain physical fundamentals makes teaching unsuccessful unless thought and care are given to the fundamental requirements which may be lacking in the original development.

The object of treatment is to make the child fit into the so-called "groove" of normal humanity, giving the type of behavior which is expected of the average person. The problem is many sided, and the various points of view cannot be satisfactorily attained by one person. The mental age of the child is far from being the only age which must be measured in the child handicapped from birth, as it is impossible to determine what limitations the complicated handicap may impose. He must be measured from the point of view of physical development, from that of social competence and from that of emotional age.

The brain is such a complicated mechanism that it is impossible to imagine two injuries which would be alike. The division of motor injuries in general between the pyramidal and the extrapyramidal system is important in determining where the lesion may be. If it can be determined that the injury is at the base of the brain and that the cortex is not involved, it is difficult to explain true mental deficiency as a result of the injury. A differentiation must be made between true mental deficiency and retardation. If, with the special methods in the hands of those accustomed to teaching handicapped persons, the child can be made to progress and learn at the rate of a year per year, true mental deficiency is obviously not present; instead, the ability to learn by the usual methods is blocked by some part of the handicap.

Actual obstetric injury is found to play a comparatively small part in the production of this condition. Damage to the cortex of the brain through manipu-

lation with forceps produces definite spasticity, while damage to the base of the brain resulting in a hemorrhage into the basal ganglions results in athetosis, tremor or incoordination of some sort. In the child whose condition is congenital, as opposed to that caused by injury at birth, there may be a congenital anomaly or deficiency in the cortical or in the pyramidal system resulting in spasticity, or a definite abnormality or absence of part of the basal nuclear mechanism, resulting in athetosis. In the postencephalitic condition damage is found which produces spasticity, as well as damage producing athetosis.

There is therefore a triple causation—congenital malformation, injury sustained at birth and encephalitic changes. There are two chief resulting conditions—spasticity and athetosis. The combination of the two is comparatively rare. They must be differentiated, as the methods used in the treatment of the two conditions are different. The neurologic examination differs depending on which condition is present. The necessity for differentiation is emphasized because not only are the methods of treatment different but the general characteristics of the spastic and the athetoid child vary widely.

In determining the proper regimen and method of treatment it must be determined what the various age levels are—mental, physical, emotional and social. The distribution of the handicap must be considered, to decide whether the work is to be concentrated on walking, use of the arms, speech or a combination. Much can be gained by starting treatment early.

With reference to muscle training, the spastic group must be treated by gradual voluntary exercises or by surgical operation, to reduce the spasticity. Neurectomy must be carried out with great care. Lengthening of tendons may be considered in some cases. Tenotomy should be done rarely. Joint fusion and joint block operations are sometimes used but should be worked out with great care. More recently the technic of muscle transplantation in spastic extremities has been developed and apparently offers great possibilities. Surgical intervention, however, should never be considered as more than one step in the treatment of the spastic child. In the athetoid patient little can be accomplished by surgical operation. The basic principle here is relaxation. Section of the lateral columns of the cord eliminates a large part of the athetosis from the extremities, but the operative risk is great.

There must be a correlative program in the treatment—orthopedic, pediatric, neurologic—with the assistance of the physical therapeutist and the speech expert on the motor side, of teachers accustomed to dealing with the problem on the educational side and of the psychologist to adjust the patient and his behavior to the world at large. Physical therapy should be followed by occupational therapy, and this in turn by vocational training.

DISCUSSION

DR. ABRAHAM LEVINSON: The term "cerebral spastic paralysis" could be applied to various conditions, such as cerebral trauma sustained at birth, cerebral agenesis, postencephalitis, postmeningitis, skull fracture and familial progressive spastic paraplegia. Most frequently, however, the term is used to designate cerebral damage sustained at birth or insufficient development of the brain. This term is often used synonymously with "Little's disease."

The management and care of cerebral spastic paralysis should start as soon as a diagnosis is made or as soon as the condition is suspected. It may therefore start at birth or may not start until the patient is several months old. Whatever the cause, every spastic child needs not only orthopedic but pediatric care, as all such patients present pediatric problems.

Spasticity present at birth or appearing a few days afterward usually speaks for an organic cerebral condition. However, tetany may have to be ruled out. Whenever tetany is suspected, the blood calcium should be determined, and if it is low, calcium should be administered. The question whether spinal puncture

should be done in the spastic newborn has not been finally answered. I believe that spinal puncture should not be done unless there are other signs of increased intracranial pressure.

Most spastic infants are hard to feed; most of them vomit, and very few gain weight. As a matter of fact, persistent vomiting and failure to gain in weight in the absence of signs of pyloric stenosis or other gastric disturbance should cause the pediatrician to suspect the presence of cerebral involvement.

Hyperactivity and irritability are often prominent symptoms and have to be suppressed with medication. Spastic children require large doses of bromides or of phenobarbital. They are usually sensitive to atropine but not to bromides or barbiturates.

Convulsions, when present, require large doses of sedatives, and at times nothing will relieve them except repeated spinal punctures. If hydrocephalus occurs, repeated spinal punctures are indicated. If little fluid is obtainable by spinal punctures, ventricular punctures are indicated.

Since in most cases spasticity and other cerebral symptoms do not manifest themselves in the first few months of life the problem of management does not become acute until the patient is at least 6 months old and sometimes not until he attains the age of 2 or 3 years, when both physician and parents are convinced of the correctness of the diagnosis.

From the standpoint of management children with paralysis must be divided into two classes, the hopeful and the hopeless ones. As a rule the criterion is the mental state. One can overcome a certain amount of spasticity but not idiocy or imbecility. Sometimes the outlook can be judged clinically and other times only by means of encephalograms. If the encephalogram shows extensive cortical atrophy, the case is hopeless. No one is to judge who shall live and who shall not; all children with cerebral spasticity should therefore be cared for. Children with low mentality should receive the ordinary physical care, but in the long run are better off in an institution than at home. It is unfair to the parents to have them bear all the brunt of a crippled child who lives a vegetative life and who in addition may have convulsions. Institutionalization is particularly necessary when there are other children in the family.

The economic circumstances of the parents must be taken into consideration in the decision; the poorer the parents the more advisable it is to institutionalize the patient. Some parents will refuse to part with their defective children at any cost.

Children with a fair mentality should have everything possible done to make them at least useful to themselves. It is not only important to keep up the patient's nutrition but to give him speech training, if possible, and orthopedic care. Establishing special schools for spastic children should be one of the duties of every board of education. The pediatrician, the orthopedist and the physical therapeutist should cooperate to make these children more comfortable.

Dr. Bert I. Beverly: This scholarly presentation has been interesting and instructive. A few points are sufficiently important to emphasize.

There has been a gradual change in the conception of the etiologic background of spastic paralysis. Neuropathologic reports and other studies indicate that by far the most common cause is cerebral agenesis. Injury at birth is the next most common cause but apparently is responsible for only a small percentage of cases. Cerebral sclerosis, encephalitis, vascular accidents, poisoning and trauma are other causes.

The importance of differentiating the spastic from the athetoid patients cannot be overestimated because of the totally different methods of treatment. My associates and I have found that the latter respond well to phenobarbital, given in rather large doses and over a long period of time.

The psychologic care is extremely important. One must first combat unhealthy attitudes in the parents. Most commonly the parent overindulges and protects the handicapped child. This is usually interrupted, however, by resentment over the slow progress of the child and the use of force. Inability to use muscles is

always a handicap. Restriction of movement in any baby causes crying. The spastic child enjoys remaining dependent and infantile while young; later, however, he recognizes his handicap and inability to do things that others are doing. He therefore begins to experience feelings of inferiority and resentment. It is necessary then to provide an environment in which the spastic child can grow up and fulfil his inner emotional needs. His handicap and training must be considered in terms of growth and development of the self as a whole. This makes the problem orthopedic, social, psychologic, educational and psychiatric.

DR. C. W. PEABODY: I should like to ask Dr. Phelps to comment on some phases of the problem which he touched on briefly. One of them rises out of a development which is under way in Detroit at the present time. Some years ago, in attempting to grapple with this problem, which seems to me to be in the field of the orthopedic surgeon, I started out with the matter of selection of cases and tried to obtain a better understanding of the causes and possibly of the frequency of cerebral agenesis. The neurosurgeons gave satisfactory cooperation, and in the study of doubtful cases through encephalography they became much interested in going into the background of cerebral birth palsy and studied the birth history in detail.

We now have an extensive body of statistics which, I think, are significant. Although the number of injuries sustained at birth was not great in the Detroit area, there has been marked diminution in the number. On the other hand, there seems to be an increase in cerebral birth palsy. The study has led to the conclusion that too frequently mothers are allowed to give birth to children without knowing anything about it. There is a high percentage of respiratory difficulty and anoxemia in hospitals where that procedure is used. In hospitals where nothing like twilight sleep is given, one finds that the incidence of birth palsy is small. In the group where a great deal of that kind of management is carried out, there is a definite increase in the incidence of asphyxia and of subsequent palsy.

I should like to have Dr. Phelps tell the members what idea he has with respect to that particular etiologic factor, not gross hemorrhage, not mechanical trauma, but anoxemia or asphyxia.

DR. WINTHROP MORGAN PHELPS: I think Dr. Levinson has brought out an important point in the necessity for differentiating between cerebral palsy on the basis of improper development or of injury sustained at birth and such conditions as lead poisoning and tetany. It is always necessary to have the condition determined carefully by the pediatrician and the neurologist before deciding definitely that the patient should be turned over to an orthopedic surgeon for treatment. I think encephalography is important in doubtful cases. It helps a great deal in separating children who look like idiots from those who are idiots. Athetosis can involve the muscles of the face as well as those of the arms and legs, and because a child has peculiar facial movements, which may be purely motor in origin, he should not be considered hopeless or feebleminded. Some children who look mentally normal turn out to be not teachable or trainable. That is true also of the babies in whom convulsions are present. Of course, convulsions do not come necessarily from cerebral palsy. There are many other causes.

Dr. Beverly brought out the interesting point of cerebral agenesis being responsible for cerebral palsy in a much greater degree than is known. I might mention a child born after forty-eight hours of labor, a difficult birth, who was blue for a long time and died of pneumonia at the age of 4. Permission for an autopsy was secured. This child was athetoid. The brain was sectioned, and in the opinion of several competent pathologists that child never had had any basal ganglions. The basal ganglions had never developed. There was no evidence of injury at birth.

I am interested in the use of phenobarbital. A child may improve under the administration of this hypnotic, but if it is stopped he may appear worse. In other cases it is useful because it shows the child the advantage of being relaxed and shows him the advantage of relaxing voluntarily instead of depending on drugs.

In answer to Dr. Peabody's question, I would say that I did not go into detail because I knew it would take too much time. Certainly asphyxia and anoxemia are factors. The nerve tissue is the most easily injured in the body because it is the most highly developed, and when it is deprived of blood during or after birth it is definitely damaged. My associates and I have found that true in a large number of birth histories. One hears about the child being born with the cord around the neck—so many normal children are born that way that I am doubtful of the significance of that factor alone.

MOTION PICTURE DEMONSTRATION OF THE TREATMENT OF FRACTURE OF THE FEMUR. DR. JOSE VALLS, Professor of Surgery, University of Buenos Aires (by invitation).

This film deals with the treatment of fresh intracapsular fracture of the neck of the femur. Prior to 1933 practically all such fractures were treated by the Whitman method, and union was attained in only about 40 per cent of them. In 1933, following the publication of the Smith-Petersen method, that technic was adopted—open operation and the use of intra-articular nailing. The difficulty was to insert the nail into the center of the neck of the femur, and an apparatus was devised which permitted accurate location of the nail. The open operation was found, however, to be inconvenient and not without hazard. It is a major operative procedure and is particularly serious in the elderly person, and it is in such persons that most of these fractures occur.

The so-called blind nailing was adopted in 1935. The apparatus used is demonstrated in the film. Two series of cases are reported, one in which use was made of the original Smith-Petersen technic and one in which the blind method was used. It is not really blind, because the insertion of the nail is accurate. A very small incision is required, and if the nail is properly inserted there will usually be union. It is a satisfactory procedure if done in the proper manner.

The nail is not removed unless the hip becomes painful. Some patients have had the nail in place for two or three years without trouble. Walking is permitted with calipers, the leg in a plaster cast, within three or four days after operation.

Sometimes it is found after some months that aseptic necrosis of the head has taken place; sometimes the head is seen to be deformed. Dr. Phemister has demonstrated this change, and others have also recognized it.

The three flange Smith-Petersen nail may be too large, and this may cause some trouble in the blood vessels entering the head and thus injure the circulation. Practically all the patients were operated on under spinal anesthesia; a few, under local anesthesia. The youngest patient in the series was 45; the oldest, 92.

DISCUSSION

DR. WILLIAM R. CUBBINS: The instrument which Dr. Scuderi devised is a modification of that of Dr. Valls. While my colleagues and I are interested in this invention, our chief concern is with the life of the head of the femur, and we are convinced that the accurate reduction which has been made with this open operation and the use of the flange has enabled many femoral heads to live which would otherwise have undergone aseptic necrosis. We are still in doubt as to the possibility of obtaining an accurate reduction of the fragments without open operation. With an open operation reduction is difficult; without such an operation, it must be much more difficult.

DR. GEORGE L. APFELBACH: My associates and I have always been interested in any new method for putting one of the various types of flanges into the neck of the femur, extracapsularly, without any incision. We have always felt that when this has been done accurately, osteosynthesis of this bone has been accomplished. In our work we have felt uncertain of this method and have employed the Cubbins-Callahan-Scuderi operation. By this method we have operated on 17 patients. Our opinion is not worth as much as that of Dr. Cubbins or of

Dr. Callahan, who have done more than 100. One thing I have learned about the operation is that there is no better approach to the neck of the femur than Dr. Callahan's incision. Other surgeons besides the speaker employ the extracapsular method. Dr. King of Melbourne, Australia, objects to the intracapsular method because of infections. This has been done away with in Dr. Callahan's incision, since one does not do any dissection so as to produce fat necrosis.

In valgus fracture, which all feel will heal without operation because of its impaction, we are much interested to corroborate this fact, also that Shenton's line was perfect before operation, and to verify the position of the head and the neck. We find that these facts were true in this case. The objection to the extracapsular method of the speaker, in our opinion, is the inability to reduce accurately the head and neck, which is requisite in all fractures. Also finding the capsule between fragments has led us to believe that we will get more union in opening the joint, since we can remove interposed tissue and do an open operation.

On the other hand we are much interested in the speaker's method, which, with proper fluoroscopic examination, table and equipment, we will probably tend to use more and more, because there will be greater facility in checking the position of the fragments at the time of operation.

Dr. Jose Valls: In reply to Dr. Cubbins, I would like to say that the method of Dr. Scuderi is a modification of the original Valls method. It is not always simple to reduce this fracture. My associates and I control it with roentgenograms, lateral and anteroposterior, and when reduction is not satisfactory we manipulate it again. But under spinal anesthesia, with not too much traction and not much abduction, reduction is usually satisfactory. The method of nailing is not simple, but with practice it becomes simpler. I can now put the director in the proper location practically the first time. Sometimes a slight change is necessary after the first roentgenogram is made.

Book Reviews

Ueber die geburtstraumatischen Schädigungen des Zentralnervensystems. By Dr. H. Nevinny. Price, 7.60 marks. Pp. 87, with 8 illustrations and 12 tables. Stuttgart: Ferdinand Enke, 1936.

The study of birth injuries of the central nervous system reported in this book is based on cases of 93 infants of a total of 15,130 infants over 1,500 Gm. in weight born in the Obstetrical Hospital in Stuttgart, on cases of 40 infants of a total of 8,425 infants born at the University Obstetrical Hospital in Innsbruck and on 20 cases from the University Obstetrical Hospital in Königsberg—a total of 153 cases, in all of which the diagnosis was proved by careful postmortem examination.

The author discusses separately the cases in which birth was spontaneous and those in which there was an operative delivery. The injuries occurring in spontaneous births are considered more significant because they offer more accurate information of the cause or causes, since in cases of operative delivery it is impossible to estimate what part is played by the operative procedures employed. The author has critically analyzed the material with especial reference to the factors which might be responsible for injury to the central nervous system.

Birth injury to the central nervous system was found at autopsy in 0.34 per cent of all the cases of spontaneous birth at Stuttgart and in 0.36 per cent at Innsbruck, and in nearly every case it was probably the cause of death. Since only a little more than half of the infants that died came to autopsy, the absolute percentage of fatal injuries to the central nervous system must be considered substantially higher.

Of all the infants that died after spontaneous birth and came to autopsy, about one third of the premature infants and one fourth of those born at full term showed intracranial hemorrhage. All of the premature infants had extensive hemorrhage, and nearly three fourths of them had tears in the tentorium.

In two thirds of the cases the mothers were primiparas. In those cases of intracranial hemorrhage without tentorial tears, the mothers were primiparas in the great majority of instances.

The duration of labor was short in a preponderant majority of both the primiparas and the multiparas; especially was this true of the second stage, which was often rapid in its course.

Gross mechanical factors played an essential etiologic role only in the cases of premature infants. In the infants born at full term, conditions of congestion and asphyxia were of the greatest importance, even in the frequent cases with a short second stage.

An unusually high incidence of mild to severe congenital abnormalities was noticed in the cases with injury to the central nervous system. The author interprets this as evidence of a generally inferior heritage, which may have contributed to an increased tendency to circulatory difficulties and stasis.

The prophylactic use of metrazol during labor as a stimulant to the circulation of the mother and of the fetus is discussed and recommended.

The author has carefully analyzed his material, and the book is a good review of the subject. Any one interested in the newborn, either from the standpoint of the obstetrician or from that of the pediatrician, would do well to read this book.

The Rehabilitation of Speech. By Robert West, Ph.D.; Lou Kennedy, Ph.D., and Anna Carr, M.A. Price, $4. Pp. 475, with 28 illustrations. New York: Harper & Brothers, 1937.

For the physician interested in speech defects and their cause and correction there is much of value in this volume that is not available in his usual medical sources. The discussion of the factors concerned in normal speech is excellent,

and there is a good analysis of the factors which produce difficulties, including maldevelopments, anatomic defects of the vocal mechanism, psychologic disorders, neuropathies, endocrine disturbances and impaired hearing.

The carefulness and detail of this study will help to give the pediatrician, especially, a much better insight into speech problems among his patients. While none of the authors is a physician, the medical point of view is kept well in mind, and stress is laid on attention to correctable deviations from health as a prerequisite to speech training.

The general physician will probably be surprised at the number of considerations he has overlooked in regard to speech defects. He will have a wholesome respect for the patience and training required to carry on rehabilitation of speech properly as well as for the extent of this special field. After he has done what he can medically, he probably will be willing to turn his patient over to the specialist for speech training.

The book is a mine of information, although the digging is not too easy. The text is highly technical, and one suspects that it would be more readable and even more informative if the style and vocabulary were less pedantic. Definitions, synonyms and minute expositions may be necessary for students, but they may bore the informed physician. Perhaps the excursions into the medical field are at times unnecessarily wide, and the authors may not always be on familiar ground. For instance, there is apparently considerable confusion of meningitis with encephalitis and hydrocephalus.

The pediatrician or laryngologist who is seriously interested in the subject will be well repaid for ploughing through this text. He will gain considerable new information and an increased respect for those who devote themselves to this specialty.

The Etiology of Mental Deficiency, with Special Reference to Its Occurrence in Twins: A Chapter in the Genetic History of Human Intelligence. Psychological Monograph, vol. 48, no. 4. By Aaron J. Rosanoff, M.D.; Leva M. Handy, M.A., and Isabel Rosanoff Plesset, B.A. Price, $2. Pp. 137, with 26 tables. Princeton, N. J.: Psychological Review Company, 1937.

This excellent monograph reports the findings, summary and conclusions of a study of 366 pairs of twins with mental deficiency in one or both of each pair. The chief purpose of the observation was to gather information on the etiology of mental deficiency.

The authors attempted to determine whether the factors producing mental deficiency were pregerminal, germinal, embryonic, intranatal or postnatal. The material was gathered from many institutions and cities. The intelligence quotient of the patients was the measure of intelligence used. A brief summary of data on each pair of twins is included in the report. These case histories and reported findings, however, are not sufficiently complete to allow the reader to arrive at definite conclusions.

Some of the conclusions reached are: 1. Mental deficiency and some of its complicating conditions are more common in the male. 2. The sex distribution of intelligence is unequal, the female sex being slightly favored. 3. About one fifth or one fourth of the difference between sexes is attributable to the sex-linked genetic factor of intelligence. "It would seem that scarcely more than half of the cases of mental deficiency are of hereditary origin." The authors also conclude that mental deficiency is more common in twins, more common in monozygotic twins, more common in the first-born twin and more common in the twins prematurely born or markedly underweight at birth. "All this points directly or indirectly to cerebral birth trauma as a factor of the highest importance in the etiology of mental deficiency."

The evidence presented does not seem to warrant this conclusion. The monograph, however, is instructive and is profitable to any one interested in twins or in mental deficiency.

Die Typologie der Halsdiphtherie. By Privatdozent Dr. H. Seckel. Price, 8.80 marks. Pp. 107, with 10 illustrations and 21 tables. Berlin: S. Karger, 1937.

In this monograph Dr. Seckel reviews his observations on 1,339 cases of diphtheria in 3 groups: group I, local; group II, progressive, and group III, toxic and septic. The 875 cases in group I were characterized by spotty, insular or spreading membranes and the 269 cases in group II by 10 different types of condition in the throat. In group III the 195 cases are divided according to toxicity. There are a pretoxic type and types with first, second and third grade toxicity, as well as hypertoxic and mixed types (toxicity associated with various infections). Sixty-three of the patients had other infections, such as measles, pertussis and lobar pneumonia. Attention is called to the common association of hemorrhagic diathesis, herpes, eosinophilia and fever with the disease and statistics are given on the number of male and female patients and the various age groups. The greatest number of cases occurred in patients from 2 to 12 years of age. Many of the patients had recurrent diphtheria, i. e., diphtheria occurring within four weeks after the original infection. There were 14 cases of recurrent involvement, or 1.6 per cent, in group I; 14, or 5.5 per cent, in group II, and 6, or 3.1 per cent, in group III. This would indicate that the more severe the type of diphtheria, the greater is the protection established. Such an experience with recurrent diphtheria is rarely encountered in large municipal hospitals for patients with contagious disease in this country.

Dr. Seckel calls attention to the difference between the response to the Schick test in the early stage of the disease and the response to Zoeller's test. The former test is usually positive at the start of the infection and negative later, while the latter (sensitivity to diphtheria proteins) is usually negative at first and becomes positive later.

This monograph is an interesting one, although I feel that too much of an attempt is made to systematize the various types of diphtheria. It would be impossible for a physician to keep in mind the major types and the 20 or so odd subtypes of this disease.

Die Epilepsie: Biologie, Klinik, Therapie. By Dr. Felix Frisch. Price, paper, 8 marks; cloth, 10 marks. Pp. 144, with 9 illustrations. Vienna, Leipzig & Berne: Verl. f. Medizin Weidmann & Co., 1937.

As is implied in the subtitle, Dr. Frisch in this handy volume discusses the biologic, clinical and therapeutic phases of the mysterious seizures which are known as epilepsy. He logically begins with a brief but comprehensive review of the physiology of the brain. The seizure is defined on a pathologicophysiologic basis: cerebral irritability from various causes at certain reduced threshold levels brings about the convulsions. The factors involved may be prenatal or postnatal anatomic changes, such as hydrocephalus or cerebral injuries, inflammatory or infectious structural changes in childhood or later years or senile changes. There may be a constitutional predisposition involving physicochemical or metabolic phenomena or a faulty endocrine system.

The clinical discussion includes an analysis of the sensory-motor phenomena with subdivisions of the various types of epilepsy, the psychic phases leading to the seizure and the vegetative phenomena accompanying and following the convulsions. There is a comprehensive discourse on the differential diagnosis between the various types of epilepsy classified according to cause. Therapy, which is given in detail, includes all accepted modes of treatment, which make use of sedatives, diet (including the ketogenic regimen), foreign protein, the various forms of physical therapy, encephalography, decompression, psychotherapy, education, etc. I was happy to note that eugenic precautions are recommended as the only effective measures to be taken against epilepsy.

This is a handy little reference book on epilepsy, clearly yet modestly written. There is much philosophy in it, as well as a good deal of common sense.

Directory of Pediatric Societies*

INTERNATIONAL

International Association of Preventive Pediatrics

President: Prof. S. Monrad, Dronning Louises Børnehospital, Copenhagen, Denmark.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

International Congress of Pediatrics

President: Prof. Luigi Spolverini, Policlinico Lungo Tevere Melini 24, Rome, Italy.
Secretary: Professor Vitetti, Rome, Italy.
Place: Boston. Time: September 1940.
American Committee:
Chairman: Dr. Henry F. Helmholz, Mayo Clinic, Rochester, Minn.
Secretary: Kenneth Blackfan, 300 Longwood Ave., Boston.
Canadian Committee:
Chairman: Dr. H. B. Cushing, 1390 Sherbrooke St., W., Montreal.
Secretary: Dr. H. P. Wright, 1509 Sherbrooke St., W., Montreal.

International Congress for the Protection of Infancy

Secretary: Prof. G. B. Allaria, Corso Bramante 29, Torino 120, Italy.
Place: Frankfort on the Main, Germany. Time: June 12-18, 1938.

FOREIGN

British Paediatric Association

President: Dr. J. Wilkie Scott, 40 The Rope Walk, Nottingham, England.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

Danish Pediatric Society

President: Dr. E. Lenstrup, Copenhagen, Denmark.
Secretary: Dr. E. Gjørup, Dronning Louises Børnehospital, Copenhagen, Denmark.

Paediatrický Spolok na Slovensku

President: Dr. A. J. Chura, Lazaretská 6, Bratislava, Czechoslovakia.
Secretary: Dr. S. Limbacher, Dlhá 2, Bratislava, Czechoslovakia.
Place: Pediatric Clinic, University, Bratislava. Time: Six times a year.

Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. T. Twistington Higgins, 12 Queen Anne St., London, W. 1.
Secretary: Dr. Harold Edwards, 57 Queen Anne St., London, W. 1.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:15 p. m.

Palestine Jewish Medical Association, Section of Physicians of Children's Diseases

President: Prof. S. Rosenbaum, 26 Bialikstr., Tel Aviv, Palestine.
Secretary: Dr. A. Brünn, 9 Maazestre, Tel Aviv, Palestine.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Sociedad Cubana de Pediatría

President: Prof. Félix Hurtado Galtés, Carlos III 7, Habana.
Secretary: Dr. Carlos Hernández Miyares, San Lazaro 370, Habana.
Place: Cátedra de Clinica Infantil, Hospital Mercedes, Habana. Time: Third Thursday of every month.

Société de Pédiatrie de Paris

President: Dr. B. Weill-Hallé, 49 Avenue Raymond Poincaré, Paris.
Secretary: Dr. Jean Hallé, 10 bis rue du Pré aux Clercs, Paris.
Place: Hôpital des Enfants Malades, 49 rue de Sèvres, Paris. Time: 4:30 p. m., third Thursday of every month.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. Clifford D. Sweet, 2940 Summit St., Oakland, Calif.
Secretary: Dr. Albert D. Kaiser, 16 N. Goodman St., Rochester, N. Y.
Place: San Francisco. Time: June 13-17, 1938.

American Academy of Pediatrics

President: Dr. Philip Van Ingen, 125 E. 71st St., New York.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.
Place: Del Monte Hotel, Del Monte, Calif. Time: June 9-11, 1938.
Region I. Place: Hotel Seneca, Rochester, N. Y. Time: Nov. 11-12, 1938.
Region II. Place: Skirven Hotel, Oklahoma City. Time: Nov. 16, 1938.
Region III. Place: Statler Hotel, Detroit, Mich., and Ann Arbor, Mich. Time: Oct. 27-29, 1938.

American Hospital Association, Children's Hospital Section

Chairman: Miss Mabel Binner, Children's Memorial Hospital, Chicago.
Secretary: Winifred Culbertson, Children's Convalescent Hospital, Cincinnati.

American Pediatric Society

President: Dr. Kenneth D. Blackfan, 300 Longwood Ave., Boston.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid St., St. Louis.
Place: Berkshire Inn, Great Barrington, Mass. Time: May 5-7, 1938.

Canadian Society for the Study of Diseases of Children

President: Dr. Alton Goldbloom, 1543 Crescent St., Montreal, Quebec.
Secretary-Treasurer: Dr. Pearl Summerfeldt, Hospital for Sick Children, Toronto, Ont.
Place: Kingston, Ontario. Time: June 3-4, 1938.

Society for Pediatric Research

President: Dr. Samuel Z. Levine, 525 E. 68th St., New York.
Secretary: Dr. A. A. Weech, 3975 Broadway, New York.
Place: The Berkshire Inn, Great Barrington, Mass. Time: Afternoon of May 4 and morning of May 5, 1938.

SECTIONAL

North Pacific Pediatric Society

President: Frederick Fischer, 407 Riverside Ave., Spokane, Wash.
Secretary: Dr. C. L. Lyons, Paulsen Medical-Dental Bldg., Spokane, Wash.
Place: Seattle. Time: Last Saturday in January 1938.

Southern Medical Association, Section of Pediatrics

Chairman: Dr. Charles E. Conrad, 209-210 Professional Bldg., Harrisburg, Va.
Secretary: Dr. Hughes Kennedy Jr., Highland Plaza Apts., Birmingham, Ala.
Place: Oklahoma City. Time: Nov. 15-18, 1938.

STATE

Alabama Pediatric Society

President: Dr. J. H. Baumhauer, 56 St. Joseph St., Mobile.
Secretary-Treasurer: Dr. M. Vaun Adams, 803 Government St., Mobile.
Place: Mobile. Time: Third Monday in April 1938.

Arkansas State Pediatric Association

Chairman: Dr. E. C. McMullen, 500 Main St., Pine Bluff.
Secretary: Dr. Madeline M. Melson, 909 Main St., Little Rock.
Place: Texarkana, Ark. Time: February 1938.

California State Medical Society, Section on Pediatrics

Chairman: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Secretary: Dr. Hartzel H. Ray, 23-2d Ave., San Mateo.
Place: Pasadena. Time: May 9-12, 1938.

Florida State Pediatric Society

President: Dr. Douglas D. Martin, 442 W. Lafayette St., Tampa.
Secretary: Dr. Warren W. Quillian, 227 Avenue Aragon, Coral Gables.
Place: Concurrent with state association meeting at time of convention.

Georgia Pediatric Society

President: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St., N. E., Atlanta.
Place: Augusta. Time: April 1938.

Hezekiah Beardsley Pediatric Club of Connecticut

President: Dr. J. Harold Root, 103 N. Main St., Waterbury.
Secretary: Dr. Joseph L. Hetzel, 103 N. Main St., Waterbury.
Time: Three meetings a year.

Indiana State Pediatric Society

President: Dr. Ernest R. Carlo, 2902 Fairfield Ave., Fort Wayne.
Secretary-Treasurer: Dr. Mathew Winters, 23 E. Ohio St., Indianapolis.
Time: Two meetings a year.

Iowa Pediatric Society

President: Dr. Morgan J. Foster, 837 Higley Bldg., Cedar Rapids.
Secretary-Treasurer: Dr. Arnold M. Smythe, 406-6th Ave., Des Moines.

Louisiana State Pediatric Society

President: Dr. Clarence H. Webb, 624 Travis St., Shreveport.
Secretary-Treasurer: Dr. Ruth Aleman, 1407 S. Carrollton Ave., New Orleans.
Place: New Orleans. Time: April 25-27, 1938.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. John D. Craig, 33 E. 61st St., New York.
Secretary: Dr. Norman L. Hawkins, 11 Public Sq., Watertown, N. Y.
Place: New York. Time: May 9-12, 1938.

Medical Society of the State of Pennsylvania, Pediatric Section

Chairman: Dr. John P. Scott, 1740 Bainbridge St., Philadelphia.
Secretary: Dr. John M. Higgins, 600 S. Wilbur Ave., Sayre.

Michigan State Medical Society, Pediatric Section

Chairman: Dr. C. R. Dengler, 131 W. Michigan Ave., Jackson.
Secretary: Dr. Ward Chadwick, 524 Medical Arts Bldg., Grand Rapids.

MISSISSIPPI STATE PEDIATRIC SOCIETY

President: Dr. Guy C. Jarratt, 920 Crawford St., Vicksburg.
Secretary-Treasurer: Dr. Harvey F. Garrison Jr., 315 E. Capitol Pl., Jackson.
Place: To be designated by Society. Time: Yearly.

NEBRASKA PEDIATRIC SOCIETY

President: Dr. J. A. Henske, 1614 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. H. Murphy, 915 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

NORTH CAROLINA PEDIATRIC SOCIETY

President: Dr. John LaBruce Ward, Arcade Bldg., Asheville.
Secretary: Dr. Lewis Elias, 36 Grove St., Asheville.

OKLAHOMA STATE PEDIATRIC SOCIETY

President: Dr. A. L. Salomon, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. Ben H. Nicholson, 301 W. 12th St., Oklahoma City.

SOUTH CAROLINA PEDIATRIC SOCIETY

President: Dr. Leland B. Salters, 317 S. Warley St., Florence.
Secretary-Treasurer: Dr. D. Lesesne Smith Jr., 187 Oakland Ave., Spartanburg.

TENNESSEE STATE PEDIATRIC SOCIETY

President: Dr. Eugene Rosamond, 1074 Madison Ave., Memphis.
Secretary: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.
Place: Nashville. Time: April 12-14, 1938.

TEXAS PEDIATRIC SOCIETY

President: Dr. John G. Young, 3930 McKinney Ave., Dallas.
Secretary-Treasurer: Dr. F. H. Lancaster, 4409 Fannin St., Houston.
Place: Galveston. Time: May 10-12, 1938.

VIRGINIA PEDIATRIC SOCIETY

President: Dr. W. Ambrose McGee, 616 W. Grace St., Richmond.
Secretary: Dr. John M. Bishop, Medical Arts Bldg., Roanoke.
Place: Danville, Va. Time: October 1938.

WEST VIRGINIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

President: Dr. Claude L. Holland, 400 Locust Ave., Fairmont.
Secretary: Dr. Theresa O. Snaith, Weston.

LOCAL

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. William M. Champion, 2323 Prospect Ave., Cleveland.
Secretary: Dr. Arthur J. Horesh, 10515 Carnegie Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

President: Dr. T. B. Verner, 170 St. George St., Toronto.
Secretary: Dr. D. V. Hutton, 170 St. George St., Toronto.

BRONX PEDIATRIC SOCIETY

President: Dr. Samuel Tripler, 1555 Grand Concourse, New York.
Secretary: Dr. Harry S. Altman, 940 Grand Concourse, New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

Brooklyn Academy of Pediatrics

President: Dr. Walter D. Ludlum, 1421 Cortelyou Rd., Brooklyn.
Secretary: Dr. John A. Monfort, 861 Carroll St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, July, August and September.

Central New York Pediatric Club

President: Dr. Frank Vasder Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Third Thursday of April and September.

Chicago Pediatric Society

President: Dr. C. A. Aldrich, 723 Elm St., Winnetka, Ill.
Secretary: Dr. George F. Munns, 723 Elm St., Winnetka, Ill.
Place: Children's Memorial Hospital, 710 Fullerton Ave., Chicago. Time: Third Tuesday of each month, October to May, inclusive.

Dallas Pediatric Society

President: Dr. W. H. Bradford, 1719 Pacific Ave., Dallas, Texas.
Secretary-Treasurer: Dr. John E. Ashby, 3622 Fairmont Ave., Dallas, Texas.
Place: Bradford Baby Hospital. Time: 1 p. m., second and fourth Saturdays of each month.

Detroit Pediatric Society

President: Dr. W. J. Scott, 5140–2d Ave., Detroit.
Secretary: Dr. Harold E. Clark, 100 Atkinson Ave., Detroit.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. T. F. Davenport, 104 Ponce de Leon Ave., Atlanta.
Secretary: Dr. James P. Hanner, 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Houston Pediatric Society

President: Dr. Walter F. Qualtrough, 920 Westheimer Ave., Houston, Texas.
Secretary-Treasurer: Dr. Allan Penny Bloxsom, 4402 Travis St., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

Intermountain Pediatric Society

President: Dr. Eugene Smith, 385–24th St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 1020 Boston Bldg., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

Kansas City (Missouri) Pediatric Society

President: Dr. W. R. Moore, 620 Francis St., St. Joseph.
Secretary: Dr. F. S. Hogue, 1103 Grand Ave., Kansas City.
Place: Kansas City General Hospital. Time: On call.

Los Angeles County Medical Association, Pediatric Section

President: Dr. Edwin F. Patton, 3875 Wilshire Blvd., Los Angeles.
Secretary-Treasurer: Dr. Henry F. Gallagher, 1930 Wilshire Blvd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd.
Time: Second Monday of February, April, June, October and December.

MEDICAL SOCIETY OF THE COUNTY OF KINGS AND THE ACADEMY OF MEDICINE OF BROOKLYN, PEDIATRIC SECTION

President: Dr. Harry R. Litchfield, 163 Eastern Parkway, Brooklyn.
Secretary: Dr. Jacob Rosenblum, 550 Ocean Ave., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: Third Wednesday of each month, October to May.

MEDICAL SOCIETY OF THE COUNTY OF QUEENS, INC., SECTION ON PEDIATRICS

Chairman: Dr. James Dobbins, 42-04 Ditmars Blvd., Long Island City, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144–38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May

MEMPHIS PEDIATRIC SOCIETY

President: Dr. Clyde V. Croswell, 1052 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. David W. Goltman, 1073 Madison Ave., Memphis, Tenn.
Place: John Gaston Hospital. Time: Quarterly.

MILWAUKEE PEDIATRIC SOCIETY

President: Dr. Joseph Shimpa, 2309 N. 36th St., Milwaukee.
Secretary: Dr. Helen Jane Zillmer, 781 N. Jefferson St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. Henry E. Utter, 122 Waterman St., Providence, R. I.
Secretary-Treasurer: Dr. Henry E. Gallup, 1101 Beacon St., Brookline, Mass.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Chairman: Dr. Samuel Z. Levine, 525 E. 68th St., New York.
Secretary: Dr. Philip M. Stimson, 25 Claremont Ave., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

NORTHWESTERN PEDIATRIC SOCIETY

President: Dr. Roger L. J. Kennedy, Mayo Clinic, Rochester, Minn.
Secretary-Treasurer: Dr. Robert Rosenthal, 437 Lowry Medical Arts Bldg., St. Paul.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

OKLAHOMA CITY PEDIATRIC SOCIETY

President: Dr. A. L. Salomon, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. G. R. Felts, 1200 N. Walker St., Oklahoma City.
Time: Alternate months.

PHILADELPHIA PEDIATRIC SOCIETY

President: Dr. Julian M. Lyon, 40 Llanfair Rd., Ardmore, Pa.
Secretary: Dr. Aims C. McGuinness, Children's Hospital, 1740 Bainbridge St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each months from October to April, inclusive.

PITTSBURGH PEDIATRIC SOCIETY

President: Dr. James LeRoy Foster, Highland Bldg., Pittsburgh.
Secretary-Treasurer: Dr. E. R. McClusky, 3200–5th Ave., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate month from October to June, inclusive.

Richmond Pediatric Society

President: Dr. A. S. Hurt, 1028 W. Franklin St., Richmond, Va.
Secretary-Treasurer: Dr. Louise Fry Galvin, 2416 Stuart Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

Rochester Pediatric Society

President: Dr. J. Merrel Parker, 11 N. Goodman St., Rochester, N. Y.
Secretary: Dr. H. C. Soule, 16 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month.

Rocky Mountain Pediatric Society

President: Dr. John Schoonover, Republic Bldg., Denver.
Secretary: Dr. F. Craig Johnson, 1850 Gilpin St., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7:30 p. m.

St. Louis Pediatric Society

President: Dr. John Zahorsky, 536 N. Taylor Ave., St. Louis.
Secretary-Treasurer: Dr. Max Deutch, 634 N. Grand Blvd., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. Frank H. Douglass, Medical Dental Bldg., Seattle.
Secretary: Dr. C. Luverne Smith, Stimson Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

Southwestern Pediatric Society

President: Dr. Louis M. Earle, 6381 Hollywood Blvd., Los Angeles.
Secretary: Dr. Philip E. Rothman, 3875 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Damon O. Walthall, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. D. Murray Cowie, University of Michigan, Ann Arbor, Mich.

Westchester County Medical Society, Pediatric Section (New York)

President: Dr. R. A. Higgons, 264 King St., Port Chester, N. Y.
Secretary-Treasurer: Dr. Elvira Ostlund, 131 Purchase St., Rye, N. Y.
Place: Grasslands Hospital. Time: Third Thursday in October, December, February and April.